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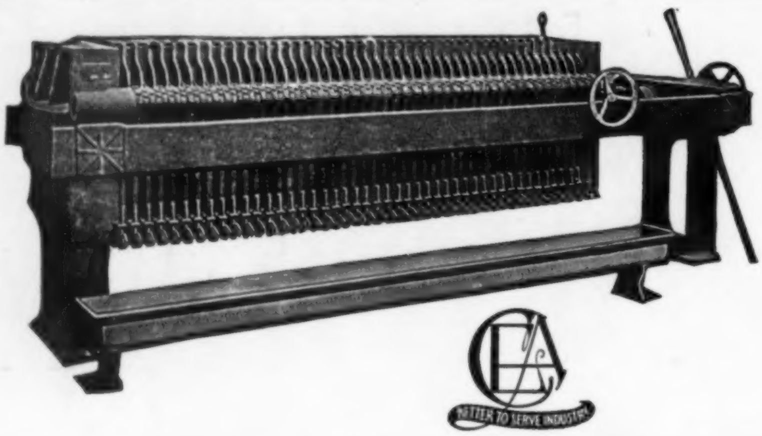

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CHEMICAL & METALLURGICAL ENGINEERING

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H. C. PARMELEE, Editor

Volume 29 — New York, December 17, 1923 — Number 25

General Electric Co.'s Contributions to Research

CONFESSION may be good for the soul, but generally it hurts one's pride. However, when occasion arises for the acknowledgment of error, we recall, with gratitude to the author, the maxim that the man who never makes a mistake is dead or out of the running. And, being human, we make mistakes—sometimes; and—always—we are in the running, and therefore prone to fall.

A few issues back we credited the General Chemical Co. of New York with a gift of $5,000 to the Cavendish Laboratory at Cambridge, whereas we should have credited it to the General Electric Co. On discovering the error we entertained secret hopes that the General Chemical Co. might have stepped into the breach, made the gift in time to receive more congratulations, and so saved us from the humiliation of admitting our fallibility. But this was expecting too much, and we realize that it would have been difficult afterward to give credit where it was due in the first place.

It was a generous gift, worthy of the spirit of Steinmetz; and this time we offer our congratulations in the right direction and apologize humbly for our error in making the first announcement.

The Reward of Fair Dealing

WHEN Japan was stricken by the recent earthquake and fire that laid waste its principal cities, it was immediately recognized throughout the world that vast quantities of construction materials would be required for rebuilding. Curiously enough there followed an advance in prices in these materials in some countries that were in a position to furnish a substantial part of the needed steel, lumber, glass, etc. This being brought to the attention of authorities in the United States, an effort was promptly made to pledge American manufacturers to maintain pre-disaster prices on all construction materials for which Japan might come into our market. The response was in the affirmative and practically unanimous, whereupon Japan was notified that she might expect fair treatment and no profiteering in any of her transactions with American producers.

Now virtue should be its own reward, but it very frequently happens that tangible and substantial compensation comes to those who give a square deal, particularly to those who are in distress and might be imposed upon. We are reliably informed that no less than $2,000,000 worth of orders has been placed in the United States for materials with which to rebuild Japan's devastated area, and that more business is likely to follow. It would be difficult to estimate the value of this incident as a bond of friendship and good will between the United States and Japan. In past years there has been no little talk of a military clash between these two countries, but if we may judge from the generous spirit of sympathy shown by the United States for Japan in her recent disaster and the expressions of gratitude voiced by the individuals as well as the government of that nation, the possibility of anything but friendly rivalry is remote. Thus "grim-visaged war hath smoothed his wrinkled front" as this touch of nature draws two nations closer together.

Progress in The Patent Office

IT IS encouraging to note that since Congress increased the salaries of examiners and provided for a larger personnel in the Patent Office, substantial progress has been made in bringing the work of that important institution more nearly up to date. The present condition is still far from satisfactory and can be improved only by increasing the force and making salaries sufficiently attractive to draw competent men into the service and hold them there. And since industry is the principal beneficiary of the patent system in this country and the chief sufferer from its neglect, it devolves upon industry to present the needs of the Patent Office to Congress and demand adequate support.

At the beginning of the Harding administration the Patent Office was in arrears to the extent of 42,000 applications and was not keeping pace with current receipts. Applications were then coming in at the rate of 9,000 a month and only 7,000 could be handled. The consequence was that the office fell behind about 19,000 applications during the first year and almost as many during the second, until there was a total of 74,000 applications in arrears last September. In the meantime the influence of additional appropriations and increased personnel has been felt and today there are but 66,000 applications in arrears. This means that by working under great pressure and putting in much overtime—nights, Sundays and holidays—the office has handled in the last 3 months 8,000 more applications than have been received. This is a commendable record, but obviously one that cannot be continued. Nor is it one that should be continued in the interest of efficiency in the Patent Office and service to industry. The examination of patents should not be conducted under high pressure nor should loyal members of the force of examiners be asked to work overtime as a part of their regular program. The plain duty of the government is to furnish a sufficient number of men to carry on the work in a more rational manner.

The outlook for the future with the present personnel is that a gain can be made on applications now in arrears at the rate of 1,000 a month. But this means that applications will still lie untouched for periods ranging

from a year to 16 months depending upon the division in which they are filed and the amount of work involved. Further, it means five and one-half years before the work can be brought up to date. Plainly this is an intolerable condition, one that should not be allowed to continue indefinitely. The Patent Office should be organized to permit handling applications and issuing patents within 30 days of their receipt instead of a year or more as at present.

Among government institutions the Patent Office is unique not only in being self-supporting but in turning a surplus into the federal treasury. Fees more than cover the cost of examination and printing. The sale of copies of specifications alone produces an immense revenue, because their publication costs but 6c. per copy while the sale price is 10c. As many as 200,000 are sold in a single month and a stock valued at $3,000,000 is always on hand.

The relation of the Patent Office to industrial prosperity in the United States is so intimate that progress may almost be measured by the speed with which applications for patents are disposed of. New construction, employment and production frequently depend on the patentability of a process or product. Business and industry stand ready to risk investment if patents are granted, but are likely to become weary of waiting a year or 16 months for an undermanned government institution to function. No opportunity should ever be missed to impress the Congress with the needs of the Patent Office.

Another German Invasion?

LATELY industrial conditions in Germany appear to have taken a turn for the worse. The failure of the program of Chancellor Stresemann has proved particularly disappointing to the German chemical industries, even though the end of passive resistance in the Ruhr may eventually mean the easing of restrictions on raw materials and manufacturing. Apparently the leaders of these industries had relied on the Chancellor's industrial experience and his first-hand knowledge of the needs of the manufacturer. They hoped that he might somehow point the way out of the political mire of government extravagances and the exorbitant taxes.

The fall of Stresemann, if we can place reliance on reports that come to us from Germany, may prove to be the signal for the German chemical manufacturers to abandon all hope of continuing their operations in Germany. This does not mean that all chemical activities will be transplanted, lock, stock and barrel, to other countries. It does mean, in the opinion of experienced observers, the beginning of the migration.

The situation in Germany has long since taken on a degree of hopelessness that has prompted much talk among German manufacturers regarding the desirability of undertaking manufacturing abroad. The difficulties encountered in securing raw materials and the impossibility of stabilizing markets and costs due to the fluctuating currency have no doubt been contributing factors. But perhaps the most serious burden has been the excessive taxes on production, import and export. The German chemical plants were among the few industries fortunate enough to maintain production on a large scale during the past few years and naturally the German Government has looked upon them as a lucrative source of revenue. But now it begins to look as though someone has killed the goose that laid the golden eggs. It would seem that these industries are beginning to look elsewhere for a place to transplant their activities. There are many other countries that will attract the manufacturers, but the United States has such adherent advantages, both as to raw materials and market, that it is natural that this country would be the objective of most of those who are determined to move.

In just what manner and just how soon this movement might be effected is a matter of further conjecture. Ever since the armistice delegations of German traders and financial men have been visiting this country. Lately some of the foremost of the German industry's technical experts have been inspecting our centers of chemical industry, as well as our waterpower developments. Sometimes the missions of these men have been satisfactorily explained; at other times suspicion might easily be attached to their movements. At any event it is not likely that negotiations for the purchase of plants in this country or the establishing of manufacturing subsidiaries will be made known to the general public. Such a procedure is not in keeping with methods used by the German industry in this country prior to the war, nor with those that have resulted in the German control of various French and Italian chemical industries. Rather the invasion would be of the nature of a peaceful penetration. By buying into some of the weaker chemical plants and gradually expanding operations it would be entirely possible for the Germans to obtain a strong foothold in this country before it would become generally known even to those in closest touch with the industry.

It is not our desire that our industries should become unduly alarmed over a matter still in the intangible stage of conjecture. Yet these rumors have come to us persistently and from many sources. Merely on the assumption that "Where there's smoke there's fire" we believe it is worth while to be on guard against any attempt to undermine the chemical independence which this country has attained since 1914 at such a tremendous cost in capital, research and development.

Calling on the Colloid Chemist

COLLOID chemists have already been of great service to industry and now it appears as if they would be called in to help in the problem of producing clean steel. The inclusions that constitute the "dirt" in steel are small particles of non-metallic material that were suspended in the liquid melt before the steel solidified. Steel men have made great progress in finding ways of removing all but the smallest particles, but there is a great opportunity for the man who has a good working knowledge of non-aqueous colloids to complete the work.

Much has been written of the enormous disadvantages of dirt in steel. The non-metallic inclusions, acting as internal "notches" so to speak, provide in every failure the starting point for rupture. If it were possible to distribute the stress equally, over a steel specimen of perfect uniformity, the tensile strength would be multiplied many times. The first step toward this ideal condition should be the elimination of the dirt particles that provide the tiny but acute deviations from the uniformity that would mean strength and dependability.

Superpower And Current Cost

ALL sorts of opinions seem to be rife as to the effect the proposed superpower system will have on the power bills of industrial consumers. No longer ago than last week it was stated at the annual meeting of the American Society of Mechanical Engineers that the manufacturer should not look for any cheaper power as a result of the coming of superpower. It was stated that power would remain at its present cost, at best; and the result to be hoped for was only in a surer supply to meet the ever-increasing demand.

Great as is our respect for the experience and judgment of the engineers who make such statements, there is one important fact that has apparently been left out of their calculations. It should be fairly obvious that, with a great unified current distribution system, covering the whole industrial northeast section of our country, the load factor will be considerably raised—probably doubled. By load factor is meant the percentage of the rated generating capacity that is used, considering the average load over a 24-hour period.

The maximum rated capacity of the system must be there to meet the peak loads, and the nearer the average power consumption comes to this figure the more use will be obtained from the generating equipment. Hence the lower will be the overhead chargeable against each unit of current generated. That should make a reduction in power costs large enough to interest most industrial current users.

Reactivity of High-Pressure Oxygen

RECENTLY we learned of an explosion in the engine room of a sea-going vessel which, aside from its disastrous consequences, has a lesson in it for the chemical engineer.

Apparently attempts to start the Diesel engine in this ship had exhausted a cylinder of compressed air that is reserved for this purpose, and the engineer sent out for another. Although cylinders of compressed air are available for just such emergencies, it is more than likely that oxygen will be furnished unless the use is specified, for in the vernacular of the welder oxygen is commonly called "air" to distinguish it from acetylene or "gas." At any event, in this case oxygen was obtained and evidently accepted as a substitute. But when the high-pressure oxygen came into contact with the oil in the cylinder, the difference in activity between air and oxygen was most violently demonstrated. The engine and engine room were wrecked and the unfortunate engineer lost his life.

Small wonder that oxygen producers have developed a profound respect for the gas, which is shared by most operators of oxy-acetylene welding and cutting equipment. They carefully guard against bringing it into contact with combustible or readily oxidizable materials while under high pressure. Soap and water are used to lubricate oxygen compressors, while conspicuous tags or labels on cylinders of the gas warn against the use of oil for lubricating valves or other parts exposed to the gas. When these directions are followed the use of oxygen under high pressure is without danger, as is well attested by the fact that over a billion cubic feet of the gas is used annually with almost no hazard except that introduced by carelessness or ignorance.

Manifestly it would be unfair to charge that the chemical engineer is either careless or ignorant, but it has been our experience that only a surprisingly few of our profession appreciate the enormous forces that can be released simply by bringing together oil and oxygen under pressure. All of us can recall the spectacular experiment in elementary chemistry wherein the instructor "burned" a heated iron wire in oxygen to demonstrate the enormous difference in the reactivity of the gas as compared with that of air. But how many are there who recognize the fact that at cylinder pressures, 1,800 to 2,300 lb. per square inch, this reactivity with combustible material is increased to explosive violence even at ordinary temperatures?

As the field for the commercial application of oxygen is constantly broadening in our industries, it is perhaps not out of place to sound a note of warning and to urge that reasonable care be exercised by those inexperienced in the use of oxygen under pressure.

To See Ourselves As Others See Us

OUR contemporary *Chemistry & Industry* is taken to task in a recent issue by a contributor who adopted the *nom de plume* of "Parisian." His comments on current technical English are worthy of a wider audience; they are applicable to the product of writers on both sides of the Atlantic, especially the variety that inclines toward the ponderous and impressive in literature. "Parisian" says:

> M. THE EDITOR: I read your first note, so complimentary to our language and to the French, then I turn to your first article and read the beginning sentence and ask myself what means, "I find myself in agreement with 'X' in admitting that Werner's theory of co-ordination had been very slow in receiving the recognition it deserves." I think of my school-time, when I was taught the rhetoric, as we call it—how to use grammar and to express myself in the way correct. I ask me how a theory can be slow to receive or receive at all. It is, as you have well said, the writers they seem so often to leave the expression of their thoughts to chance. It is very difficult for us strange people to know what they mean, when they write in this way and—do you not call it or is it the Professor Bone?—"activate" the passives. It is the way of your good contributor, I think; is he so much gazing at the beautiful, naked proton of the hydrogen—fortunately for our Garconnes this is not yet come to Montmartre—that his eyes are blind and he does not look at the words, the shine is so much in his eyes? I would ask, as well, what he mean when he write, "None of the chlorine can be precipitated by silver nitrate." I have not suppose chlorine is made of ones.
>
> It is sometimes very funny how you write. I see, in the second article in your beautiful journal, the gentleman say: "It is always helpful if one can look round." Perhaps some of your chief chemists think so, but in France we cultivate the sport to keep the spare figure. Thank you, sir, for your try to make the English that it can be understood. It can be very beautifully wrote. For example, if you read the English of M. Lafcadio Hearn, of the Crime of Sylvestre Bonnard, it is as beautiful as the French of Anatole France, the most perfect of the French writers, is it not so? Your servant much devoted,
>
> PARISIAN.

We agree with the critic as to the beauty of the English written by some authors. Lafcadio Hearn is mentioned as an example, to which we would add that it was he who said, "To produce even a single sentence of good literature requires that the text be written at least three times." This advice should be taken to heart by all who would aspire to utilize to the full that primary advantage that distinguishes us from the lower animals—the gift of being able to convey our thoughts in writing.

When Maker Meets User

Arsenic Industry Demonstrates Practical Value of Co-operation in Overcoming the Obstacles That Hinder Business Progress

B. R. Coad

Southern Field Agent, Bureau of Entomology, U. S. Department of Agriculture, and Chairman of Standing Committee of Arsenic Producers and Users

In the future we may well expect co-operation to be the keynote of further business progress, and even greater results may be expected when maker and user, buyer and seller, meet on common ground for sober study of their mutual problems.

THIS was our editorial prediction a year ago after a serious-minded group made up of producers of arsenic, manufacturers of arsenical insecticides, glass makers and other users of arsenic had met in New York to give sober study to the exigencies of the arsenic situation. The rapidly increasing demand for calcium arsenate had resulted in a pressing shortage of white arsenic; confusion reigned among buyers and sellers. Although inclined at first to be suspicious of one another's motives and skeptical of the efficacy of joint action, those at the meeting finally turned their attention to fundamentals and accomplished much of lasting good for the industry. Trade and agricultural requirements were carefully estimated, stocks were evaluated and an effort was made to increase arsenic production. Always, however, there was in the background a realization that the question was primarily one of supply and demand and that attempts to interfere with this natural law were more likely to do harm than good.

In order that the advantage of such a good beginning should not be lost, a standing committee on arsenic was named and instructed to continue the co-operative study. Now a year has gone by, a second meeting of producers and consumers has been held and the committee has made its report. As a sound appraisal of exising conditions and as a guide to operations in 1924, this document, published elsewhere in this issue of *Chem. & Met.*, should prove of inestimable value to the industry.

No small proportion of the credit for the committee's accomplishments has been due to the untiring efforts of its chairman, Dr. B. R. Coad, Southern field agent for the Bureau of Entomology of the U. S. Department of Agriculture and in charge of its Delta laboratory at Tallulah, La. A rare combination of scientist and practical economist, he has come to be regarded, and rightly so, as this country's foremost authority on calcium arsenate. Admittedly no other individual has been in closer touch with the situation nor shown a more comprehensive grasp of all the varied factors that contribute to it. A single example may well illustrate his peculiar insight into the arsenic problem. The official report of the meeting of a year ago contained this statement: "Dr. Coad reports that the demand for calcium arsenate for 1923 is expected to be twice as great as in 1922," which totaled approximately 16,000,000 lb. Now what do the figures for this year show? Sales were 34,000,000 lb., stocks, 3,000,000 lb., thus indicating an actual consumption of 31,000,000 lb. An uncanny prediction, to be sure, but perhaps when the study has been as intense and at the same time as comprehensive as that of Dr. Coad, the matter becomes one of knowledge rather than conjecture. In any event it is certain that there will be considerable less skepticism this year when the industry reads of the committee's estimates for 1924:

> Were it possible for manufacturers to sell calcium arsenate profitably at 11.5 to 13.5c. a pound (f.o.b. factory), the demand would be from 65,000,000 to 75,000,000 lb.; were the price to be 16c., the demand would drop to 35,000,000 or 40,000,000 lb. There is danger that this wide range of figures will give different parties an opportunity to remember only those figures that sound the sweetest; but there is no occasion for sensible men to fool themselves. The estimate shows that under reasonably favorable conditions, including a minimum spread in price and a considerable amount of early buying, the demand for calcium arsenate may again double, as it did last year. Will the supply be equal to this increase in demand?

The standing committee on arsenic, under the chairmanship of Dr. Coad, consists of George F. Loughlin of the U. S. Geological Survey, secretary; Hamilton M. Brush, manager of sales department of the American Smelting & Refining Co.; F. Y. Robertson, vice-president of the United States Smelting, Refining & Mining Co.; O. A. Haase, vice-president of the Glidden Co.; R. N. Chipman, president Chipman Chemical Engineering Co.; Frank Hemingway, manager of the development department of the Sherwin-Williams Co., and W. O. Tuck, of the Corona chemical division of the Pittsburgh Plate Glass Co.

American Institute of Chemical Engineers Discovers Scientific Washington

A Successful Invasion of the Capital Resulted in a Wider Appreciation of the Impoitance, Extent and Usefulness of the Work of the Government Bureaus

EDITORIAL STAFF REPORT

CONVENTIONS, remarked someone or other, are the second largest industry in America! There is no answer to the conundrum except that we wish they were all of the caliber of the American Institute of Chemical Engineers conventions. This last one, the sixteenth annual or winter meeting, was held in Washington, D. C., at the New Willard Hotel and elsewhere, Dec. 5 to 7. The program committee and the council decided that it would be an excellent idea to give the members of the Institute an opportunity to become better acquainted with the scientific and technical work that is being carried out by some of the government bureaus in Washington.

After 3 days of talks by the directors of various bureaus and field trips through some of the experiment stations, the Institute returned home considerably enlightened. There can be no answer but enthusiasm and appreciation when an engineer is told by the thoughtful, energetic men who are directing government research, of the kind of work that is being done, of its extent, of the spirit that animates it. Those of us who have had close contact with these splendid workers and their invaluable contributions to both industry and science prize it most highly.

In planning the program the local committee showed an intelligent understanding of the subject and the field. To know scientific Washington is no mean feat and to know it well enough to pick out the high spots and focus the attention of the Institute on them is a talent almost confined to the personnel of the committee. The sincere appreciation of the Institute has already been expressed to W. M. Corse, the chairman, and to the other Washington members, Messrs. Chambliss, Coggeshall, McBride, Gibbs, Howe and Parsons.

The vanguard of the meeting departed for Washington from New York on the "Congressional Limited" and held one of those typical Institute reunions, typical because of the genial cordiality of the spirit and the wide variety of topics interestingly discussed. A distinguished visitor at a recent Institute meeting commented on this. "Never," said he, "have I received such a cordial welcome from a group to whom I was an outsider." So from the time of the first paper till the last there is always that background.

The Institute was welcomed by Major J. Franklin Bell, Engineer Commissioner of the District of Columbia, who urged on the members the necessity and public duty of every engineer taking an active part in public affairs. In the evening an enjoyable party and dance was staged at the Willard and several confirmed addicts of the bridge table were actually seen on the floor. The formal dinner was again enjoyable, especially the stimulating, vivid picture of fourteen European countries painted by Mr. Cooper of the Y.M.C.A. staff. Friday the cavalry drill at Fort Myer was made available to those who cared to go, and many did, though the trips to the Bureau of Chemistry and the Fixed Nitrogen Laboratory were well attended in spite of the desertions.

The business sessions of the Institute have already been reported in last week's issue and the election of the officers was also announced. The Institute had the pleasure of hearing from its new president, Charles L. Reese, at the banquet.

Aside from the prepared program introducing the work of the various bureaus, there were three general technical papers presented. Dr. Hugh K. Moore of the Brown Co., Berlin, N. H., presented an exhaustive paper on "The Principles of Evaporation." This monograph contains so much that is fundamental and so many real contributions to the subject that it will be published serially in *Chem. & Met.*, beginning this week. The work on some sections of the paper alone represents tens of thousands of determinations, and the investigation has extended over years of effort.

Dr. Walter A. Patrick of Johns Hopkins discussed

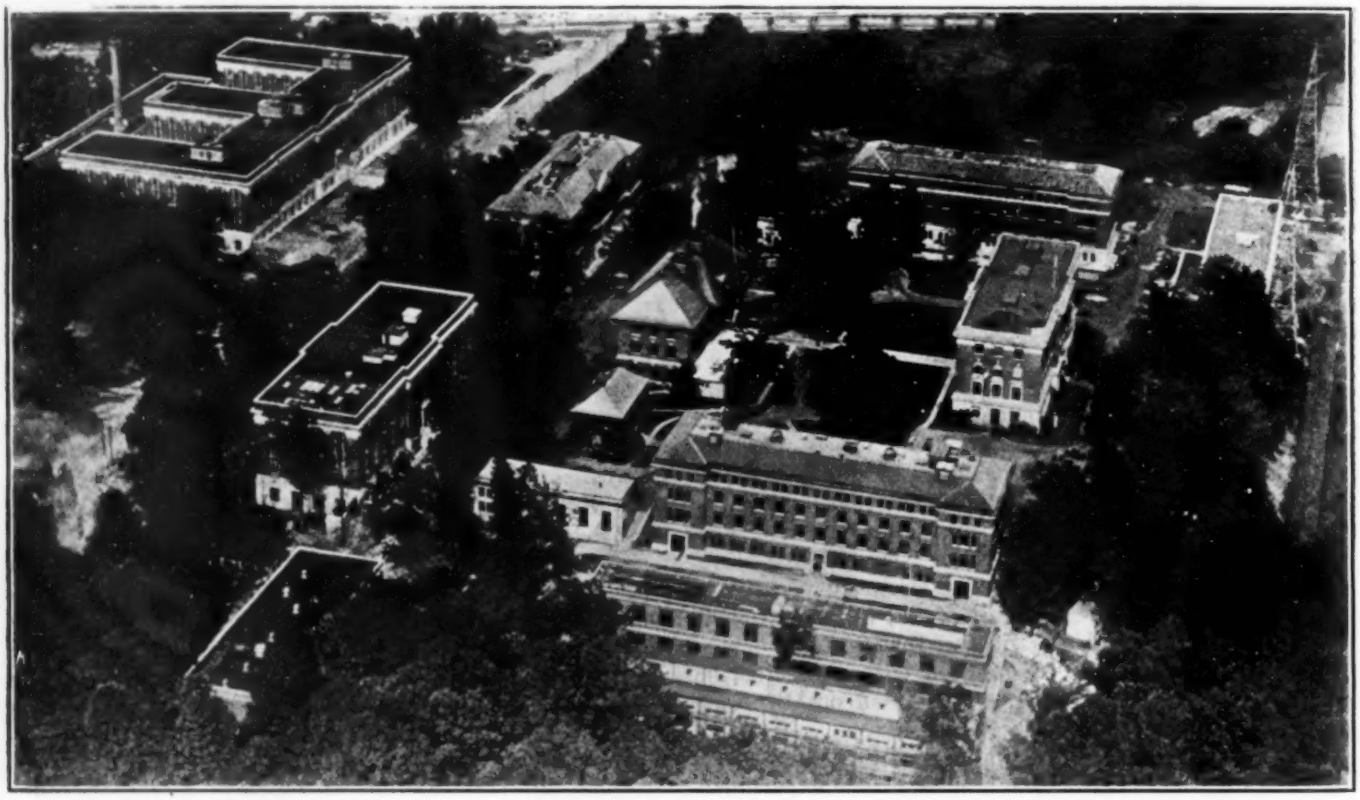
the rate of oxidation of nitric oxide, a subject on which he has carried out some ingenious experiments. His method of measurement consisted of photographing manometers that recorded pressure in the reaction vessel at definite intervals. He advanced a theory to explain the mechanism of oxidation that assumes the dissolution of the nitric oxide in a film of nitrogen peroxide on the surface of the vessel and the action of oxygen on this dissolved material. Experimental data seem to confirm this assumption. Further work is promised, and the field is one of extreme importance, as it deals with gaseous phase reactions which as a type have great industrial importance.

Some interesting calculations of the industrial possibility of fixed nitrogen were presented by Charles O. Brown, particularly the possible utilization of off-peak power to produce electrolytic hydrogen (the most expensive item in producing fixed nitrogen).

It is usually easier and logical to divide the technical side of Institute meetings into two main divisions, the first Industrial Visits and the second Technical Papers and Discussions, but the Washington meeting was unique in this respect. It will be much more graphic if we consider in the case of this meeting the various departments under a given heading. This will include both the speakers and the visits to the departments.

Department of the Interior

As director of the United States Geological Survey of the Department of the Interior, Dr. George Otis Smith discussed its relation to chemical engineering. To mobilize scientific facts for industrial use might, he said, be taken as a text for government research, and it was his suggestion that the Institute give some serious thought to the formulation of a test for the efficiency of this work. Among the things that the Geological Survey carries out is the calaloging of the minerals. Not simply minerals that are at present industrially prominent, but all minerals. Many examples from the early surveys show how invaluable a mineral may become in the course of time, which is the ultimate reason for including all minerals rather than some. Bauxite is a good example of this, as it was omitted from the early reports. Still another survey of greatest importance is the water survey, and Dr. Smith told a very interesting story of the location of a cantonment or flying field at a place where there existed only salt water for wells. The information was available in the government water surveys, but had not been consulted by the men who had charge of the flying field location. The paper has much significance, and we are glad to announce that we shall print it in full next week.



National Bureau of Standards, Washington, D. C.

Director H. Foster Bain of the Bureau of Mines was unfortunately unable to be at the meeting, inasmuch as he had been subpœnaed to appear before a prominent Senate committee. Dr. Dorsey Lyon spoke in his behalf of the work of the bureau. One of the most impressive things to the engineer unfamiliar with the extent of the bureau's work is the number of experiment stations. At Pittsburgh and at Urbana, Ill., coal experiment stations are operated, the one at Pittsburgh being an unusually large one. There are also, at Columbus, Ohio, a ceramic station; in the Mississippi Valley, a lead and zinc ore station; at Birmingham, Ala., and at Minneapolis, Minn., blast-furnace stations; at Salt Lake City, an experiment station for further work on lead and zinc; at Tucson, Ariz., a copper station; at Seattle, a station devoted to the problems of electrometallurgy, and in Alaska, a more general field service station. The bureau in general prefers to work with the co-operation of the industries, inasmuch as the data are for the industries.

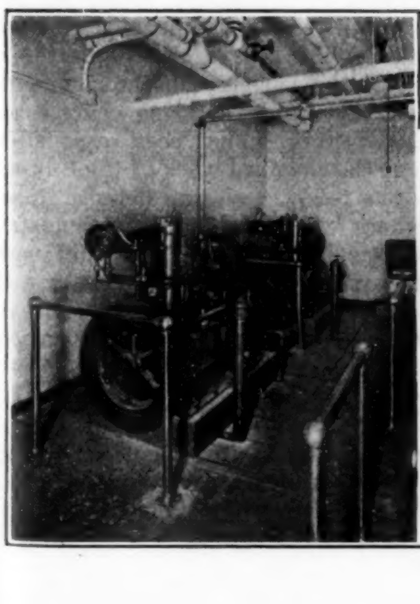
Dr. S. C. Lind, who is chief of the chemical work of the Bureau of Mines, told of the various fields in which the bureau is active. For example, the rare metals, particularly those used in the ferro-alloys, have received considerable attention, although at the present time this particular field is commercially dead, as there is on hand a large supply of ferro-alloy, a supply that is likely to last for some years to come in many instances. This is due to the great overproduction during the war. The field of the non-metallics receives considerable attention. Here the limiting factor is not the economic condition of overproduction, but the ever-present and heavy hand of freight rates.

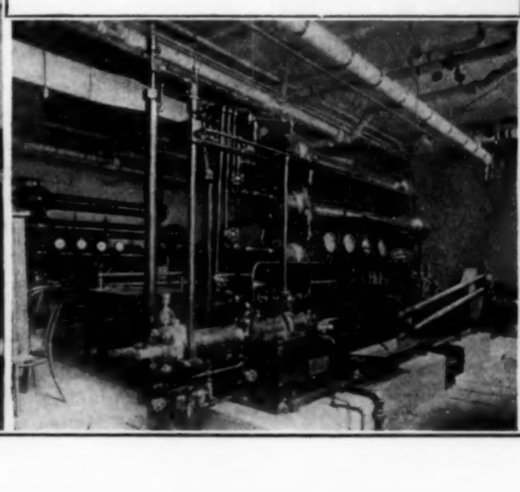
In many ways the most spectacular development in the chemical work of the bureau has been the commercial production of helium. In this connection it is interesting and somewhat significant that the United States is the only country that has large resources of helium, so far discovered. The method of producing helium from these sources, which are invariably natural gases, is by fractionating the materials. Many wells contain as high as 2 or 3 per cent helium. Those around Fort Worth, however, average about $\frac{3}{4}$ per cent. Legislation is being considered now for the conservation of this valuable material, so that in time of emergency the government may call upon it and find this vital resource in readiness. Over and above this conservation, the commercial development and use of helium will be pushed and developed with the aid of the bureau. It has been estimated that with plants at advantageous locations, the United States could build and maintain a force of 200 lighter-than-air machines of the general size and usefulness of the "Shenandoah."

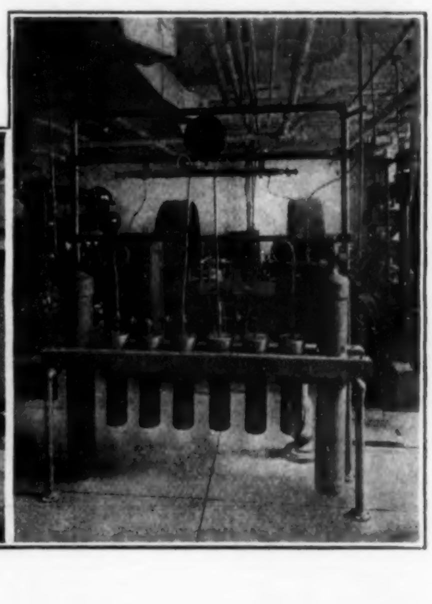
The cryogenic laboratory of the bureau has been working largely on the fundamental data of helium and its use. A number of interesting points were brought up in discussing this work. In the first place, were there any data on the dilution of helium with hydrogen to form non-combustible mixtures? Dr. Lind seemed to think that 15 per cent hydrogen at atmospheric pressure would be a safe non-explosive gas, but that in re-purifying the material after oxygen from the air has leaked in, it might be extremely difficult to avoid the explosion of such a mixture. Other methods of purifying helium were discussed, notably the burning out of impurities, which is possible but not very economical when nitrogen is a large impurity. The possibility of adsorbing helium was also discussed, and this process is actually used in the re-purification. Many other problems on the commercial utility of this material were of great interest. For example, it has been found that on a long trip so much fuel is used up in the lighter-than-air machines that great difficulty is experienced in bringing the balloon to earth again. A suggested solution to this is to condense the water from the engine exhaust. Up to the present time it has been found necessary to let helium out of the gas bags in order to get down.

Fundamental Standards of Measurement

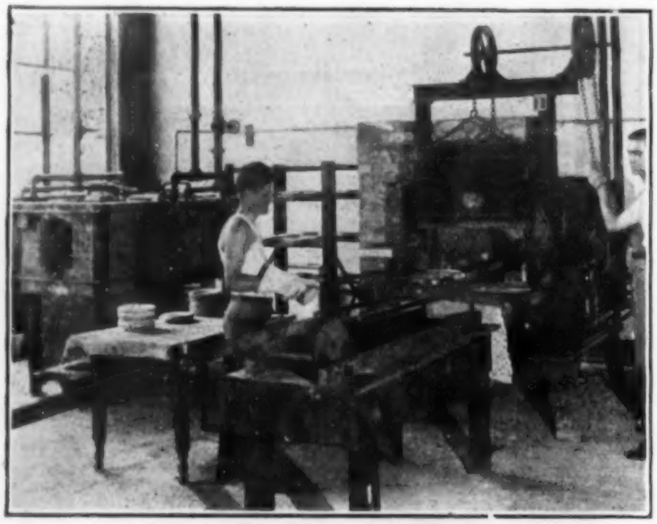
Dr. A. C. Fieldner of the Pittsburgh Station of the Bureau of Mines read a paper on the combustibility and physical properties of coke. His paper appeared in *Chem. & Met.* in the issue of Dec. 10, and need not be reviewed at this point. In discussing the paper, Dr. R. T. Haslam of the Massachusetts Institute of Technology pointed out the empirical nature of the term







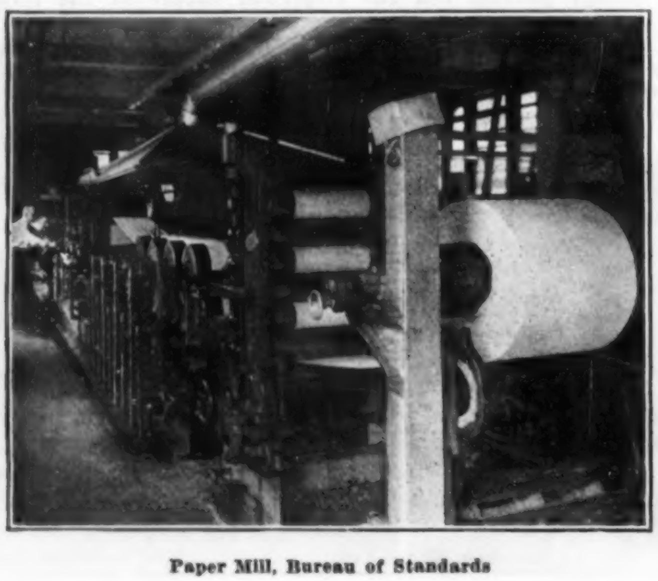
Left—Helium Compressors.
Center—4-Stage Compressors.
Right—High-Pressure Oil Separators.



Enameling Furnace, Bureau of Standards

"combustibility," and said he felt that real tests on the solubility of coke in carbon dioxide must be carried out on a full-sized blast furnace. Considerable energy on the part of the Bureau of Mines is put into the testing of explosives, so widely used in all kinds of mining endeavor.

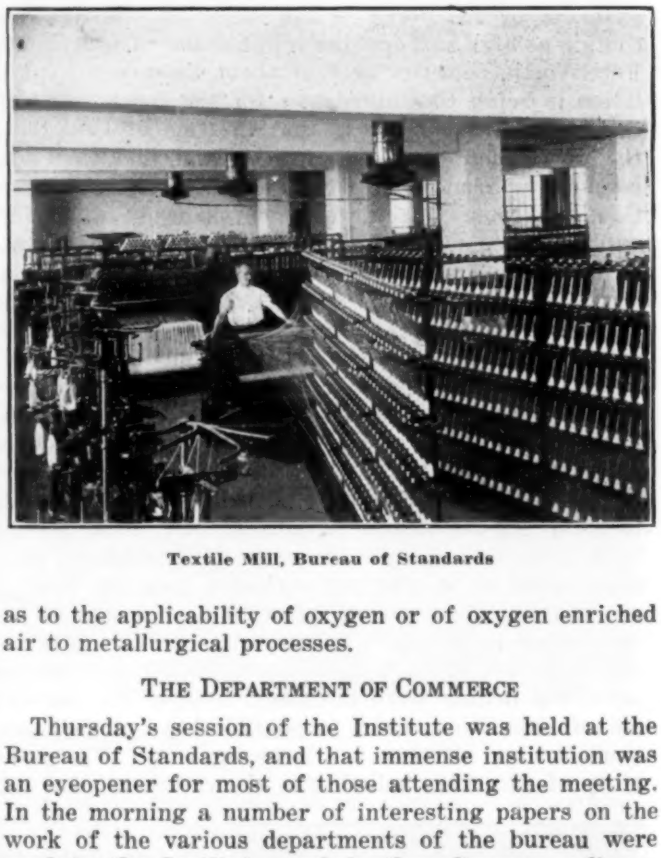
J. W. Paul described the testing of explosives for governmental and commercial use, including such tests as the permissibility, suitability, safety, etc. Among other interesting comment that Mr. Paul made was to the effect that there is no best explosive. For each specific kind of work so many factors must be considered that no generalization can be made. Several other lines of work of a more specific nature have been carried out in this department. For example, studies have been made on liquid oxygen explosives, blasting supplies, the utilization of extensive supplies of military explosives for peace-time work, together with some work on ammonium nitrate. The paper was discussed by Charles E. Monroe, one of the deans of scientific investigation in government work. One of his most interesting comments was on the spirit in which the Bureau of Mines works. It is impossible to enforce the findings of the bureau, a federal body, in a line of work which is under state control, but no such enforced control is necessary, for the bureau has with it the authority of best practice and of public opinion. Yet another cardinal principle in all this kind of investigation work is to take everyone concerned into the confidence of the government. Thus, and only thus, can a co-operative effort be evolved.



Paper Mill, Bureau of Standards

A paper from the Fuels Division, and one discussing the research carried out on petroleum by the Bureau of Mines, were read by members of these departments, the chiefs of the divisions being unfortunately unable to attend the meeting.

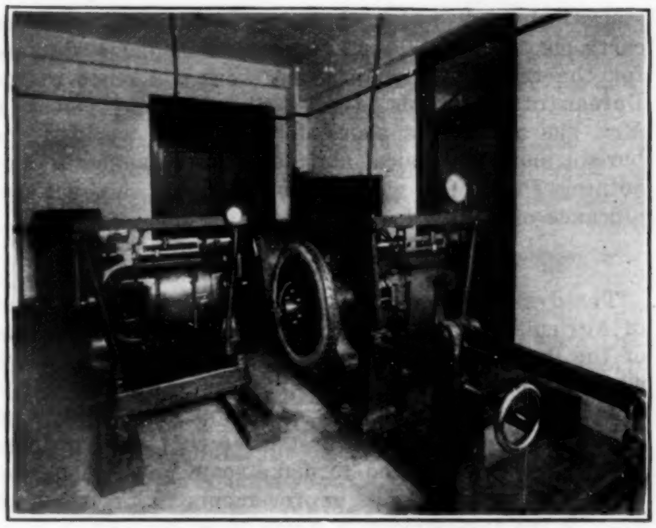
The final paper of the Department of Interior program was given by F. W. Davis, and had to do with the application of oxygen to the metallurgical and allied fields. This work has already been discussed in *Chem. & Met.* in considerable detail when the report of the committee on this subject was abstracted, vol. 29, p. 272, dated Aug. 13, 1923. Based on the assumption of oxygen at \$3 a ton, a figure which has been supplied to the committee by another committee of the Bureau of Mines, a number of interesting suggestions were made as to the applicability of oxygen or of oxygen enriched air to metallurgical processes.



Textile Mill, Bureau of Standards

The Department of Commerce

Thursday's session of the Institute was held at the Bureau of Standards, and that immense institution was an eyeopener for most of those attending the meeting. In the morning a number of interesting papers on the work of the various departments of the bureau were read to the Institute, and in the afternoon, after a luncheon at the bureau, the various laboratories were inspected. Dr. W. S. Hillebrand, for many years associated with the Geological Survey, has been responsible for the organization of the chemical work of the Bureau of Standards. This has followed several definite lines. In the first place, there were standards for industry and for schools, such as the standard pieces of cast iron, etc. These standards are supplied to industry and to other institutions as they are needed. The bureau also acts as a testing laboratory and a specification department for the government departments. The army and navy purchase large quantities of material and many specifications have been worked up for them. The bureau has carried out an investigation of the platinum group of metals and extensive investigation on electroplating and deposition of metals, the electroanalysis of gases, production of hydrogen from natural



Tire Tester, Bureau of Standards

gas, and among the other departments there are such chemical problems as sugar, metallurgy, battery, etc.

C. H. Bates director of the industrial department of the Bureau of Standards, told of the industrial research carried on, of its development from a very small beginning and of its attainment to the present tremendous size. As a representative of the United States Government, the Bureau of Standards has found it necessary to become interested in industrial research and industrial standards. One of the most recent examples of this is in chinaware, which is purchased in large quantities by the army and navy. Durability was essential and there was no durability test nor much of anything else to start with. Now they have discovered that the material manufactured in the United States is more durable than foreign chinaware. They have developed a number of tests which have proved to be very similar to actual industrial use. Still another example of the kind of work that the bureau is able to do is the investigation of high-magnesia cement and the subsequent altering of standards to conform to their findings. Mr. Bates emphasized the fact that most of the research work of the bureau is done on small plant-scale units.

One of the most interesting papers presented to the Institute was delivered by P. D. Foote on the subject "Atomic Physics and Its Relation to Chemical Engineering." Mr. Foote began by admitting that the title was distinctly misleading, that he did not know of any application of atomic physics to chemical engineering and would be grateful if any one would advise him of some relationship. Following this he began a simple, clear exposition of the present theories of atomic structure, based on the Rutherford atom and embracing Bohr's work on spectrum analysis and atomic structure. Mr. Foote's achievement was a notable one, for he made the subject intelligible to men who had no contact with it before and interesting to men who had done extensive studying in that field.

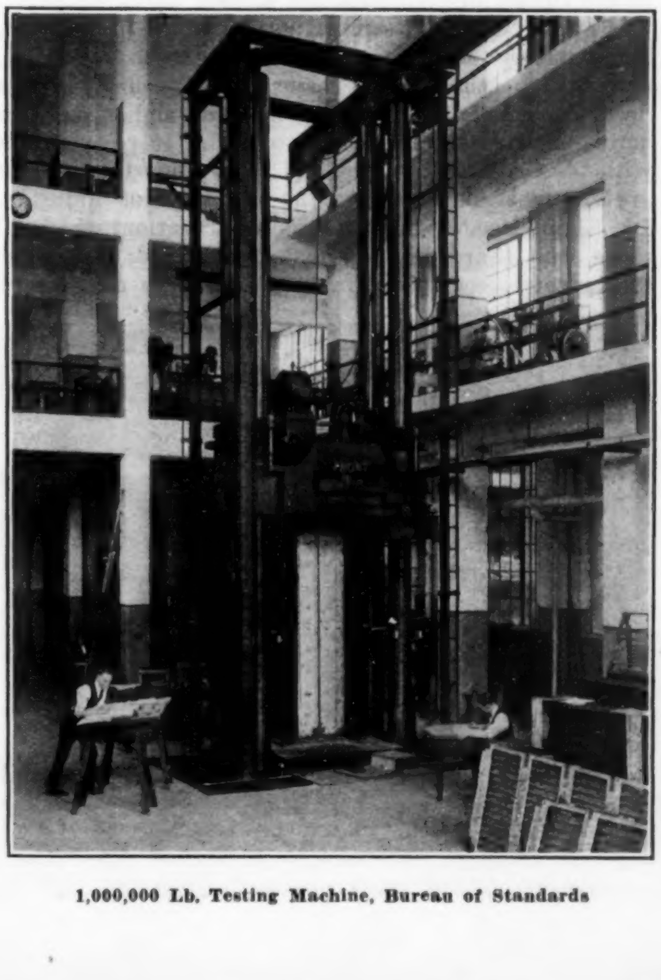
Atoms are planetary systems differing from the planetary solar system in that the solar system is an arbitrary and adjustable arrangement. If a meteor entered a solar system, there would undoubtedly be a displacement of planets, and this displacement would undoubtedly be permanent. On the other hand, if a meteor enters the atomic system there is a displacement of atoms of a definite magnitude and then a return to original configuration. The atoms will always absorb the same amount of energy from the meteor, then the atom will finally return to its original configuration. By making a few simple assumptions Bohr was able to estimate the relative kinetic energy necessary to displace the atom and from this can be calculated the energy necessary to disrupt the atom.

From another standpoint the configuration of the atoms proved most interesting. It has been possible thus to construct systems showing the orbit of the electrons in the various atoms. The rare gas helium has a balanced configuration and the next element above it, lithium, has an additional electron in an entirely new orbital plane. This orbital plane undoubtedly fills up, element by element, until it is completely filled by the time neon is reached. The next element above neon, sodium, again starts a new orbital plane up beyond the neon plane. This in turn is completed when the element argon is reached and with potassium still a further orbital plane is created. It is thus possible to develop a plane picture of the orbits of the electrons that represent approximately the picture of the element as it exists. A great many other interesting points were brought out, notably the way in which the valence electrons behaved in solution.

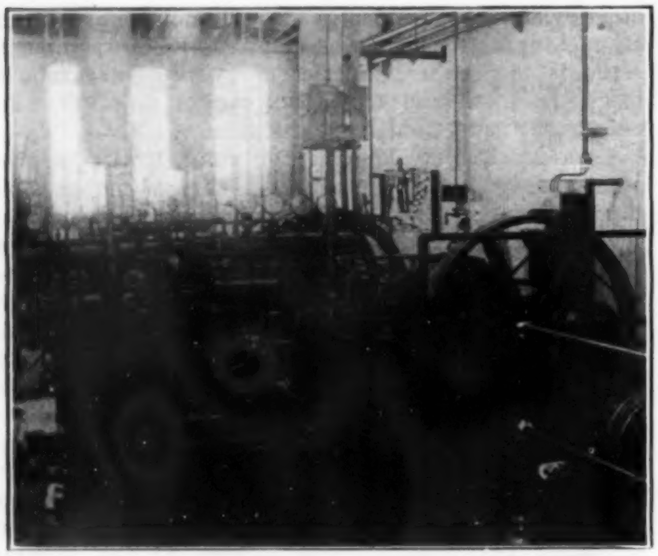
Mr. Foote was followed by H. C. Dickinson, who discussed briefly the fuel work of the Bureau of Standards. This has divided itself largely into four main divisions. The first is temperature measurement and control; second, thermal properties of matter and engineering material; third, thermodynamics and power production, and fourth, heat transfer.

The Commerce Surveys

The final paper of the Department of Commerce was one by Dr. Julius Klein, director of the Bureau of Foreign and Domestic Commerce. Dr. Klein's discussion of commodity and raw material surveys as carried out



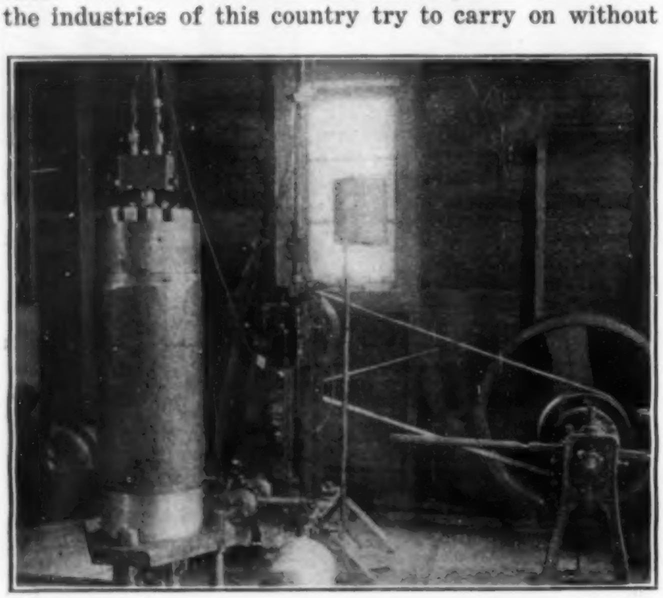
1,000,000 Lb. Testing Machine, Bureau of Standards



200 Atmosphere Compressors for Catalyst Testing

by the Department of Commerce was most illuminating. The investigation of crude rubber, nitrate and sisal are three examples of this kind of commodity survey. Each case is fairly well known to chemical engineers, except perhaps that of sisal. Here the monopoly is held by Yucatan, Mexico. Practically the entire production of this commodity is exported to the United States, where it is in very great demand by American grain raisers. Inasmuch as the situation has developed monopolistic tendencies, the subject is being investigated by men in the field.

The nitrate report made by Director Bain of the Bureau of Mines, together with Dr. Mulliken, will be available for publication within a week, and the findings of the rubber investigation are already public property. The bureau extends its investigations to less important, but none the less vital, commodities such as iodine, camphor, menthol, gums, rosins and lacs, many plants used in medicinal work, china wood oil and so on. An active mineral survey is made available in co-operation with the Geological Survey and these important results are brought constantly to the attention of industry. Dr. Klein closed with a plea for co-operation, which all those who heard him enthusiastically indorsed. Let the industries of this country try to carry on without

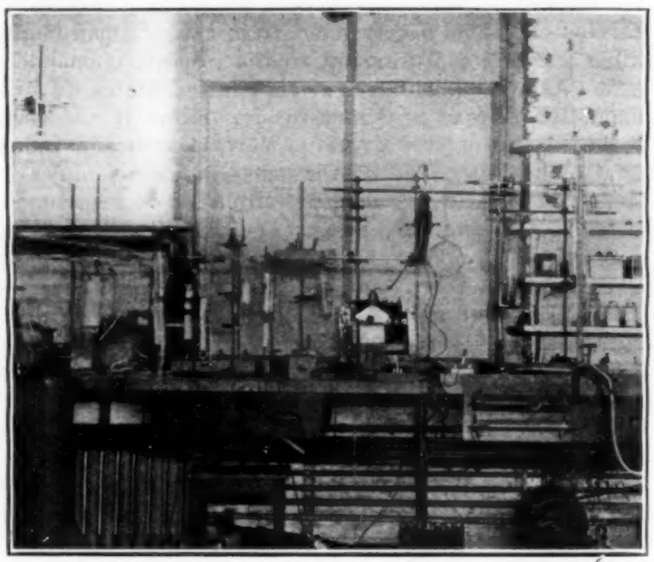


1,000 Atmosphere Direct Synthetic Ammonia Process

statistical work which the government can and does carry out, and the cry will become immediately intense for the reconstruction of such work. A visit to the Bureau of Standards is most illuminating. *Chem. & Met.* has at various times described the work of the bureau and its physical and personnel advantages, but nothing short of a visit can bring home the real significance of the work.

The Department of Agriculture

The dynamic director of research in the Department of Agriculture, Dr. E. D. Ball, gave a very vivid picture of the development and present status of the research work in the various bureaus of the department. His talk had a number of very profound morals wrapped up in it. He said in the first place that several years ago when he was asked to make some general suggestions that would lead to improvements in the research work of the Department of Agriculture, he made a careful investigation of conditions. This resulted in three fundamental changes. The first was the co-operative relations with the bureaus and state agencies working on the same problems. The second was to obtain adequate



Arc Process for the Production of Chemically Active Nitrogen

salaries for the technical men and the research men in the personnel of the bureau. The maximum salary in the bureau used to be $4,500 a year and in 1919 the turnover of the technical personnel was actually 54 per cent. Such a turnover naturally resulted in inefficient work and the turnover was largely caused by the low salaries available in the department. The third important change recommended was the prompt publication of research results. No technical man who has done a piece of research likes to have the result delayed for months or even years, and it was felt that the prompt recognition of that valuable contribution would result in more satisfied personnel. During the past few years great progress has been made along all these lines and now it has been adopted as a policy of the bureau to encourage young scientists to engage in graduate research training, to follow graduate work in some recognized institution and to secure graduate degrees with the approval and co-operation of the department heads. The work under way in the Department of Agriculture was on the program to be told by the various bureau chiefs.

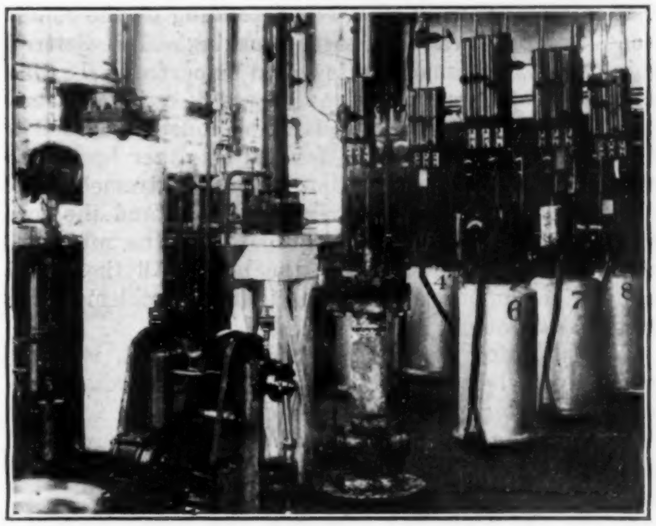
Dr. Ball wanted to call attention to some of the neglected fields of agricultural research. For example, the whole problem of weeds as a means of delaying and preventing good agricultural yield. The utilization of many agricultural products is inadequate and much greater return to the nation would be accomplished by the correct utilization of some of these products. Insecticides is still another neglected field and the whole application of chemistry to agriculture has many serious gaps in it that must be filled up.

Dr. Ball was followed by Dr. C. A. Browne, head of the Bureau of Chemistry, who traced the bureau work from its foundation in a small room with one or perhaps two men engaged in analytical work on agricultural products to its present dimensions. The work of the Bureau of Chemistry is divided into two main classes. The first part is largely regulatory work following the establishment and for the enforcement of the pure food and drugs act. Carrying out the provisions of this law costs in the neighborhood of $700,000 a year. It requires not only regulation but definite research problems for the ultimate benefit not only of the people but of industry itself. The second part of the work of the Bureau of Chemistry is agricultural and technical problems. Such things as the utilization of cane sugar sirup, the work carried out by the Citrus Fruit Laboratory in California, where lemons and other fruit that are not acceptable as first grade are utilized, the further use of waste sweet potatoes in the South and the production of furfural from corncobs in the corn states. Extensive research is also carried out on the loss of agricultural products due to micro-organisms, on dust explosions, their causes and prevention. Frequently this research, as in the case with many other departments of the government work, is carried out in co-operation with industrial plants.

Dr. Browne was asked whether there was any way in which the stigma of having been brought before the Bureau of Chemistry for investigation could be removed, if the manufacturer had been cleared. It was pointed out that several manufacturers had had to pay high premiums in educational advertising to counteract the effect of a Bureau of Chemistry investigation. In each case mentioned, the Bureau of Chemistry investigation thoroughly cleared the manufacturer of any wrong practice and the damage was not justifiable. It was suggested that possibly certain publicity should be given to the favorable results of investigation of a given manufacturer's product.

Dr. L. F. Hawley, of the Forest Products Laboratory, described the many contacts of the chemical engineer with forest products, among them paper, wood distillation, turpentine and rosin, tanning materials, medicinals and wood for structures. Mr. Hawley pointed out the way in which the Forest Products Laboratory was working to conserve wood. The first was to use less wood in construction by a better knowledge of the strength of wood. The second is to obtain a higher efficiency in the chemical processes utilizing wood. The third is in wood preservation, and the fourth in the discovery and utilization of plentiful, cheap species. Such specific investigations as yield in paper making from the sulphite and sulphate processes, utilization of waste wood in wood-distillation work, the results that can be obtained by variation in firing and also those that result from the free treatment with such materials as 5 per cent sodium carbonate solutions. Finally, considerable work has been done on prevention of decay by impregnation with various materials and a theory of wood preservation is being worked out. All of the experimental work in this kind is carried out at the Forest Products Laboratory at Madison, Wis.

Dr. Milton Whitney, director of the Bureau of Soils, discussed the question of fertilizers and soil fertility. He began by pointing out the average amounts of fertilizer used in the principal countries per acre of land. They run as follows: Germany, 188 lb., England, 167 lb.; France, 79 lb.; United States, 40 lb. This figure for the United States is boosted by the Atlantic seaboard states, where potatoes, tobacco and cotton consume it in large quantities. It is a curious thing that cotton is not fertilized west of Alabama. The necessity of using fertilizer is further emphasized by the fact



Complete 100 Atmosphere Synthetic Ammonia Plant

that more than 30,000,000 acres, or 87 per cent, of our crop is cotton, corn, oats, wheat and hay. These are single crops grown in regions where rotation is not and cannot easily be practiced, certainly not as in Europe. If, then, fertilizer be used on the same scale as in Europe, we shall have to increase our tonnage production by five times. Dr. Whitney then proceeded to analyze the sources and production of the principal fertilizer materials, showing the economic status of the various branches of the fertilizer industry and indicating the kind of work carried out by the Bureau of Soils to improve conditions. The paper is a significant one and will shortly appear in *Chem. & Met.*

Several other papers by various members of the Department of Agriculture served to bring home to the chemical engineers the use to which chemistry is being put in many lines. Dr. J. R. Mohler, of the Bureau of Animal Industry, discussed the many problems in this work. They had undertaken to prevent spoilage of animal products, such as lard, fat, ham and other meats, etc., they had investigated the hydrocyanic acid fumigation in order to eliminate such vermin as mice, rats, roaches, etc. Some work had been done on the dry rendering of fat, on soft pork, on the spoiling of milk and dairy products and on the sandiness of ice cream due to the crystallization of the sugar lactose.

Finally, Dr. F. D. Cottrell, director of the Fixed Nitrogen Research Laboratory, gave a lucid picture of the work that is being carried on in this vitally important field. An outline of this work appeared in *Chem. & Met.* last week, Dec. 10, and to this you are referred

for a more detailed idea of what the department is doing. In a few brief words, it can be said that the Fixed Nitrogen Research Laboratory is endeavoring to study the whole problem of nitrogen fixation. They are not wedded to one process; they have investigated the whole horizon. Equal care has been expended on the arc process, the cyanimide process, the Haber process, the Bucher process and many others, in proportion as they seem to show research possibilities. In connection with the Haber process, the work is now being conducted mainly on the reaction itself and on the production of hydrogen. This latter problem will receive increased attention during the next year. During the first 2 years it was necessary to develop and perfect a process of production of a catalyst that would be satisfactory under given conditions, and it was discovered that catalysts vary in efficiency depending on the conditions under which they were working. Dr. Cottrell pointed out that small plants would be perfectly feasible and plants of 1-ton size were likely to be quite economical. In Niagara Falls there is being constructed now a 7½-ton plant. The material for the catalyzer bomb has received considerable attention, it being extremely difficult to get a material which would withstand the corrosive action of both the hydrogen and the nitrogen, nickel steel being apparently the best. All these and many other important and fascinating problems have been investigated.

The laboratory, as Dr. Cottrell points out, is there primarily to help the industry. No matter what happens to the big plant, there will always be a field for the small plant in nitrogen fixation and the country at large will need ultimately a large and flourishing nitrogen industry. By turning over the initial stones of research and operating problems, the Fixed Nitrogen Research Laboratory will pave the way for a healthy, vigorous industry.

X-Ray Protection With Paint

A paper not on the program but permitted by a vote of the Council was presented by Dr. Maximilian Toch. It dealt with the discovery and use of a paint that would be opaque to X-radiation, and could consequently be used in lining the X-ray rooms in hospitals, etc. His attention was called to the problem by some work done in France in making X-rays of oil paintings. At present X-ray rooms are lined with lead and the weight of this metal requires special construction. Two other methods of protection suggested themselves: first, the use of plaster with which 50 per cent barium sulphate had been mixed, and the other the use of two or three coats of lead-barium paint. The latter method has been tested out in actual practice and both methods are now being installed in a hospital at Blythedale, N. Y. Many laboratory tests have been made and it is assured that a room so constructed will be X-ray proof. A brown coat, a scratch coat and the finish coat will be topped by three layers of lead-barium paint. The method is an interesting one and seems to offer a cheaper solution to an important problem.

Main Building, Fixed Nitrogen Research Laboratory

Little has been said of the visits to the laboratories and experimental units, and it is a somewhat impossible task to give an adequate picture of them. Many articles in *Chem. & Met.* have described and visualized particular units and we have tried to focus in the abstracts of the various addresses by the bureau chiefs the spirit and scope of the work. The physical facilities are for the most part adequate and in many cases breath-taking.

The cryogenic laboratory of the Bureau of Mines is tucked away in the cellar of the great Interior Building. Here the fundamental constants of helium and the other gases are studied. Most of the other experimental work of the Bureau of Mines is, you will remember, in other cities at various stations.

The Bureau of Standards reminds one of a very large technical school, with its tremendous buildings and vast equipment. It tests on the one hand precision thermometers and weights to the most refined accuracy and on the other great structural steel beams and units with forces that would collapse a titan. Through it all runs a sense of order and balance that is reflected even in physical arrangements.

The Bureau of Chemistry shows only its research half in Washington, its inspectors for pure food being scattered throughout the land. A modern, well-appointed laboratory with sound research throughout is evident in every problem.

Fixed nitrogen is no longer a mystery and a visit to the laboratory out at American University, where the poison gas research was done during the war, will be sufficiently convincing—work ranging from the production of activated gases in an arc discharge—work that impinges on atomic structure and molecular action—down to the ½-ton plant that is testing the Haber process as it has been perfected at the Fixed Nitrogen Research Laboratory. A live, progressive group deserving of confidence and encouragement.

The visit to the mill of the District of Columbia Paper Manufacturing Co., scheduled for the last morning of the meeting, was an agreeable surprise to every member of the Institute who attended. Ordinarily one does not think of Washington as an industrial center and would not look for a large paper mill within the confines of the city. The D. C. Paper Manufacturing Co. has been established for 24 years. The plant is located on the Potomac River near the bridge connecting Georgetown with the Virginia shore. The company has probably the most diversified production of any paper mill in the country, the products including blotting paper, catalog cover stock, pasteboard box cover stock, high-grade wall paper, photograph folder stock, etc. These products are turned out in a great variety of colors and with printed and embossed surfaces. The raw materials are pine and poplar gathered within a radius of 200 miles of the city. Some rag stock is also used. The mill is notable for its cleanliness, the orderly arrangement of its equipment and a systematic planning department which is essential in a plant manufacturing such a variety of products.

What Happens to Fruit in

Vacuum Dehydration

Apples and Pears Are Not Easy to Dehydrate for Several Reasons and It Became Rather Essential to Discover the Extent of the Chemical Changes That Took Place—This Was the Genesis of This Investigation, Which Has Contributed Valuable Results

By J. H. Buchanan and P. A. Zook
Laboratory of Food Chemistry, Iowa State College, Ames, Iowa

Due to their high content of levulose, apples and pears present difficulties in dehydration. The removal of water at temperatures of 100 deg. C. or drying at lower temperatures in the air is accompanied by a discoloration of the product. This may be due either to the decomposition of the levulose with the subsequent production of caramel or to the action of oxidases.

The vacuum process for dehydration of food products has been said by Falk to possess many advantages, one of the important ones being the lack of discoloration of the product. (See *J. Ind. Eng. Chem.*, vol. 11, pp. 1036-1040.) This has a distinct advantage in that bleaching with sulphur dioxide or some other agent is unnecessary.

In the determination of what might be the best conditions for vacuum dehydration a study was made of the changes in composition taking place during the process. These data have to do with the carbohydrates and esters of the fruits.

The experimental conditions of the dehydration were a vacuum of 28 in., a temperature of 70 deg. C. and a time of 4 hours. Under these conditions a product good in appearance and containing from 2.5 to 5.5 per cent moisture was obtained. The original samples contained from 83 to 86 per cent moisture. The samples for the dehydration and moisture determination were obtained by first peeling and then quartering the fruit. The quarters were then cut into cubes about ⅛ in. in size.

Change in Composition Determined

For the determination of change in composition, due to dehydration, samples were prepared from the same fruit. The determination of moisture, reducing sugar, total sugar, sucrose, starch and other alcohol insoluble acid hydrolyzible material and acid was made on both the hydrated and the fresh sample. The esters lost were determined from the distillate obtained during the process of dehydration. Moisture was determined by heating 15 to 20 grams of fresh sample and 1 to 4 grams of the dehydrated material at 70 deg. C. in a Freas oven, the vacuum being held at 28 in. The samples were weighed at intervals until the weights were constant.

Sugars were extracted with alcohol from 15 to 20 grams of the fresh material and from 1 to 3 grams of the dehydrated sample, according to the method of Magness. (See *J. Eng. Research*, vol. 19, No. 10, pp. 475-500.) Reducing sugars were determined by the Munson and Walker method, the cuprous oxide being ignited to cupric oxide. Total sugars were determined by taking 50 c.c. of the alcohol solution, adding 25 c.c. of water and inverting according to the modified Herzfeld method. Invert sugar was then determined as reducing sugar.

Starch and other alcohol insoluble acid hydrolizible materials were determined from the residue of the alcohol extraction according to the method described by Woodman and Magness. ("Method of Analysis," *J. Asso. Official Agri. Chem.*)

Acid was determined in 15 to 20 grams of the fresh and 1 to 3 grams of the dehydrated material by the method described by Magness. The acid was calculated as malic acid. Esters were determined in the distillate according to Leach. Due to the small amount of esters present, $N/100$ sodium hydroxide was substituted for $N/10$. Esters were calculated as ethyl acetate.

The results of this work are tabulated in Table I.

Table I—Composition of Fresh and Dehydrated Fruit

Kind of Fruit	Per Cent Moisture	Per Cent Reducing Sugar	Total Sugar as Invert	Sucrose	Starch, etc.	Acid as Malic	Esters Lost by Dehydr. as Ethyl Acetate
Apple, fresh....	84.84	63.63	75.98	11.85	32.21	39.59	0.068
Apple, dehydr..	5.30	65.75	75.89	9.60	32.04	9.57	.....
Apple, fresh....	83.91	63.51	77.89	13.66	32.83	6.11	0.041
Apple, dehydr..	3.46	65.01	77.10	11.43	32.68	6.33	.....
Pear, fresn.....	86.43	47.43	49.84	2.29	25.01	5.64	0.012
Pear, dehydr...	2.82	49.05	49.38	0.31	24.78	5.33	.....

A study of this table shows a loss in total sugars due to dehydration. This might be accounted for in a small loss of levulose due to decomposition. In the dehydration product there is a loss of sucrose and a corresponding increase in invert sugar. This might be expected, since during the first part of the process the temperature would be very favorable for enzyme action. Also hydrolysis due to the acid might occur. The table shows an acid content of from 5 to 9 per cent calculated as malic acid.

The change of a portion of the cane sugar to invert sugar may account for the fact that the dehydrated material tastes less sweet than the fresh product. Sale and Skinner, using the sweetness of cane sugar as 100, calculated the sweetness of dextrose as 52, levulose 103 and invert sugar as 78.

The small amount of esters lost during the dehydration would indicate that there was very little breaking of the cell structure of the fruits. This would be an important consideration from the standpoint of the flavor of the dehydrated product, since the quality depends to a large extent upon the cellular structure remaining unbroken.

In conclusion it can be said that under the conditions of experiment, aside from the loss of water, the characteristic change in composition of the fruits examined was the inversion of a portion of sucrose to invert sugar. Further, the small loss in ester content during dehydration indicates little breaking in cell structure.

British Methods of Coal Analysis

The British Fuel Research Board has issued an interim report on methods of analysis of coal, which discusses the proper procedure for these tests. The recommendations of this report have been adopted by the Fuel Research Board for the guidance of analysts in Great Britain. A full report, including experimental data, is promised later. The present document can be obtained for 1s. 6d., from His Majesty's Stationery Office, Imperial House, Kingsway, W. C. 2, London, England.

Nitrides as a Possible Route to

Commercial Production of Cyanides

To Compete Successfully With Existing Processes Any New Method Must Yield High Percentages of Cyanide and Permit Its Cheap Recovery

By Foord v. Bichowsky
Bichowsky & Harthan, Chemical Engineers, Glendale, Calif.

In the last hundred years a multitude of methods have been proposed for the synthetic production of cyanides, but of all these only three are in actual operation, the first in importance being the indirect method of Castner wherein metallic sodium is heated with anhydrous ammonia and then with carbon and the pure cyanide cast or molded into cakes. (U. S. Pats. 541,066 and 543,643, June 18 and July 30, 1895.)

The second method, perfected by the American Cyanamid Co., consists in first manufacturing calcium cyanamide from calcium carbide and nitrogen and then heating this material with salt to fusion in an electric furnace and chilling the molten crude calcium cyanide into flakes. (See Landis, *Chem. & Met.*, 1920, vol. 22, p. 265.)

The third method is based upon the fundamental discovery of Thompson, and extended by De Lambilly, Alder, Bucher, Thorsell and a host of others and now being developed to a commercial proposition by the work of Metzger of the Air Reduction Co., that sodium carbonate, in the presence of carbon and of iron as a catalyst, absorbs nitrogen quite vigorously to form sodium cyanide at temperatures that permit the reaction to be carried out in tubes of the but recently available nickel-iron alloys. (See Thompson, *Dinglers Polytech. J.*, 1839, vol. 73, p. 281; Ger. Pat. 69316, May 23, 1893; Ger. Pats. 1,235, 18,915 and 27,334; Bucher, *J. Ind. Eng. Chem.*, 1917, vol. 9, p. 233; Thorsell, *Z. angew. Chem.*, 1917, vol. 9, p. 233; U. S. Pat. 1,388,-586, Aug. 23, 1921.) The cyanide so obtained is impure and must be refined. Two methods have been developed for this: In the older the cyanide is dissolved out by liquid anhydrous ammonia (U. S. Pat. 1,314,236, Aug. 26, 1919), while in the more recent procedure this expensive and volatile solvent is dispensed with, the crude cyanide being treated, at low temperatures, with carbon dioxide and water and the resulting hydrocyanide acid reabsorbed in soda ash heated to about 500 deg. C. (U. S. Pat. 1,439,909, Dec. 26, 1922.) In this way a high-grade sodium cyanide can be obtained.

Possibilities of a Competing Process

For a new process to compete with these as a source of cyanide it must produce at the outset a material high in cyanogen and from which the cyanide may be economically recovered either by solution in a cheap solvent or by distillation from an electric furnace.

In a study of the problem from this viewpoint a patent of the Badische Anilin & Soda Fabrik was discovered covering the production of cyanides. (U. S. Pat. 923,012, May 25, 1909.) According to this one had only to heat titanium nitride with soda and carbon to produce sodium cyanide: $Ti_2N_2 + Na_2CO_3 + C \rightarrow 2NaCN + Ti_2O_3$, certainly, on paper, a simple enough procedure. Of course there are other nitrides that act in a similar way, but they are not so easy to prepare as is titanium nitride nor are their reaction products as easily separable from cyanide as is Ti_2O_3, since it is insoluble in water and has a high melting point.

True pure titanium compounds are not cheap, but minerals containing them are. This is especially so with the mineral ilmenite, a black mixed iron-titanium oxide, which occurs in black beach sand and in immense deposits in Norway, Canada, Virginia, Florida, New Zealand and elsewhere, and is therefore easily obtainable in large tonnage. The mineral rutile, or practically pure titanium dioxide, is also procurable in quantity, but at a considerably higher price.

Work was started upon the preparation of titanium nitrides with the studies of Wöhler and the patent of the B.A.S.F. as guides. (See Wöhler, *Annalen*, 1850, vol. 73, p. 34, vol. 74, p. 212, and Wöhler and Deville, *Annalen*, 1857, vol. 103, p. 230; U. S. Pat. 957,842, May 10, 1910.) The former had discovered that titanium dioxide would absorb nitrogen if heated with carbon to the melting point of platinum, while the B.A.S.F. patent showed that if a trace of alkali be present the reaction went nicely at 1,240 deg. C. The latter temperature would require efficient furnaces, but the finding of a suitable retort material would be the greatest difficulty, as the alkali, added as a catalyst, would attack retorts made of any but basic materials and such tubes of magnesia and the like, because of their poor conductivity and fragility, had been the bane of previous workers.

Efficient Catalyst Sought

We accordingly set out to find a more efficient catalyst, one that would allow of the formation of titanium nitrogen compounds in tubes or retorts of the nickel-iron alloys. This should be possible through the consideration of the occurrence of a copper red mass often observed in blast furnaces smelting titaniferous iron ores and first described by Wollaston exactly a century ago. (See *Phil. Trans.*, 1823, p. 17.) Wöhler later showed this to be a complex compound of titanium, nitrogen and carbon and synthesized this cyanonitride by fusing together potassium ferrocyanide and titanium dioxide, but was unable to prepare it when using potassium cyanide. This pointed strongly to the idea that iron played some sort of rôle in the nitrification. This supposition has now been investigated quite thoroughly

and it was found that metallic iron has indeed a remarkable action upon the formation of titanium nitrides. (See U. S. Pats. 1,391,147 and 1,391,148, Sept. 20, 1921.) This is especially true if the iron is in a state of molecular distribution, as is the case when ilmenite is reduced with carbon, under which condition it is necessary only to heat ilmenite with carbon, a little soda ash and nitrogen to obtain a high yield of titanium nitride at temperatures of from 1,050 to 1,100 deg. C. (See U. S. Pat. 1,408,661, March 7, 1922.)

Formation of Titanium Nitride

To illustrate how easy it is to prepare Ti_2N_2 on a large laboratory scale by means of this discovery, consider the following test: In a small pebble mill 1,500 grams of high-grade ilmenite was ground for 10 hours. To this was added 100 grams of commercial soda ash and the grinding was continued for 4 hours. Finally there was added 450 grams of a crude carbon, obtained as a byproduct in the manufacture of oil gas. This carbon contained 20 per cent of volatile material and 3 per cent of an ash which was mainly silica. The contents of the mill were then subjected to another 10-hour grinding. The ilmenite-soda-carbon powder was now stirred up with one-fifth its weight of hot water and the thick mass ground through a meat chopper in accordance with the method described by Bucher. The little briquets so formed were dried and placed in the retort. This in a large-scale plant would be a slightly inclined rotating tube of an iron-nickel alloy, equipped with thermocouples, the nitrogen, obtained from the air by burning out the oxygen and scrubbing out the resulting CO_2, being introduced at the lower end of the tube. In the laboratory this nitrogen was obtained from a cylinder of high-grade gas and was measured by passing through a dry type of house gas meter. The tube was slowly brought up to 1,000 deg. C. while passing a slow stream of nitrogen through the tube. When this temperature had been reached, the rate of nitrogen flow was increased to 2 cu.ft. per hour. The exit gas, which contained over 20 per cent of carbon monoxide, burns brightly. The temperature was slowly raised to 1,100 deg. C. and when, after 4 to 6 hours, the exit gas ceased to burn, the temperature of the retort was very gradually brought up to not above 1,150 deg. C. (2,100 deg. F.) and held between 1,100 deg. C. and that point until only a small percentage of CO remained in the exit gas. The retort, in our laboratory experiments, was allowed to cool while passing in a very slow stream of nitrogen. Upon opening the cold retort it will be found partly filled with a brass-colored shrunken mass of briquets containing about 10 per cent of combined nitrogen and showing no signs of having fused together.

In some of the runs the briquets employed were made up without carbon, and sodium aluminate was used as a binder. In this case dry, CO_2-free, natural gas (80 per cent methane) was first run through the furnace until the briquets were reduced and then when the furnace temperature reached 1,050 deg. C., the gas was diluted with two times its volume of nitrogen, the rate of flow of the mixture being kept at 2 cu.ft. per hour. Where natural gas is very cheap, this method is recommended, as no impurities are introduced in the form of an ash and the results are just as good as those obtained with carbon.

For the purpose of subsequent work the crude titanium nitride, obtained in either of the above ways, was divided into two parts. From one the iron was removed by means of warm diluted sulphuric acid and when the evolution of hydrogen ceased and all the iron had gone into solution the residue was filtered and the cake washed free from acid. The dry iron-free material which constitutes the part insoluble in acid contains at least 18 per cent nitrogen, the theoretical amount when all impurities such as silica, carbon, etc., are taken into consideration. Under the above conditions and working with a continuous acting revolving tube furnace, the cost of preparing titanium nitride, or cyanonitride, when the value of the accompanying iron as ferrous sulphate (copperas) is taken into consideration, would certainly be very low.

Occasionally the account of an industrial research reveals not only a process of commercial possibility but also an ingenious and versatile attack on a difficult problem. Such an attack should carry to men in production work as well as to research men, faced continually with difficult technical problems, a certain stimulus, a spur to their ingenuity. Here is such a story.

The Preparation of Sodium Cyanide

An iron-free titanium nitride prepared in the above way was the material used in many of the experiments. Former work according to patents consisted of the following processes: Moise, who operated with boron nitride, was the first worker. Then came Dankwardt, who devised a continuous process and worked with alkaline nitrides formed intermittently, *in situ*, and who used sodium fluoride and calcium carbide as the other reagents. Next came Schmidt, who worked with the same nitrides, but employed soda ash and carbon. He was succeeded, in point of time, by Bosch, of the B.A.S.F., who studied the action of titanium nitride, as has already been mentioned, and later the nitrides of silicon and aluminum. (For these processes see Ger. Pat. 91,708, April 7, 1897; U. S. Pat. 746,795, Dec. 15, 1903; Ger. Pat. 176,080, Oct. 6, 1906; U. S. Pat. 1,022,351, April 2, 1912.)

When we came to repeat what appeared to be the very simple patent procedure of the last worker, we ran into many discouraging difficulties and it was only through the discovery of a new reaction and new compounds that we finally achieved satisfactory results.

The first experiments duplicated the methods recommended by Bosch. Using iron-free titanium nitride and following the patent instructions, only very slight yields were obtained. In the first place, in order to obtain a homogeneous melt much higher temperatures were required than the "red heat" recommended in the specification and further the nickel crucible used as container seemed to destroy the cyanide. But this was not the chief difficulty, for as soon as the soda melted an evolution of gas took place and carried the carbon, which was in the form of lampblack, to the top of the melt, where by reason of its low specific gravity it remained and could not be made to enter the viscous mass except by stirring and then only very incompletely. In order to thin out the melt various fluxes were tried, of which salt and soda in the molecular proportions of $Na_2CO_3.4NaCl$ gave the best results, but while the cyanide yields were much better the problem of separation of cyanide from the soluble reaction products was greatly complicated. The action of carbon

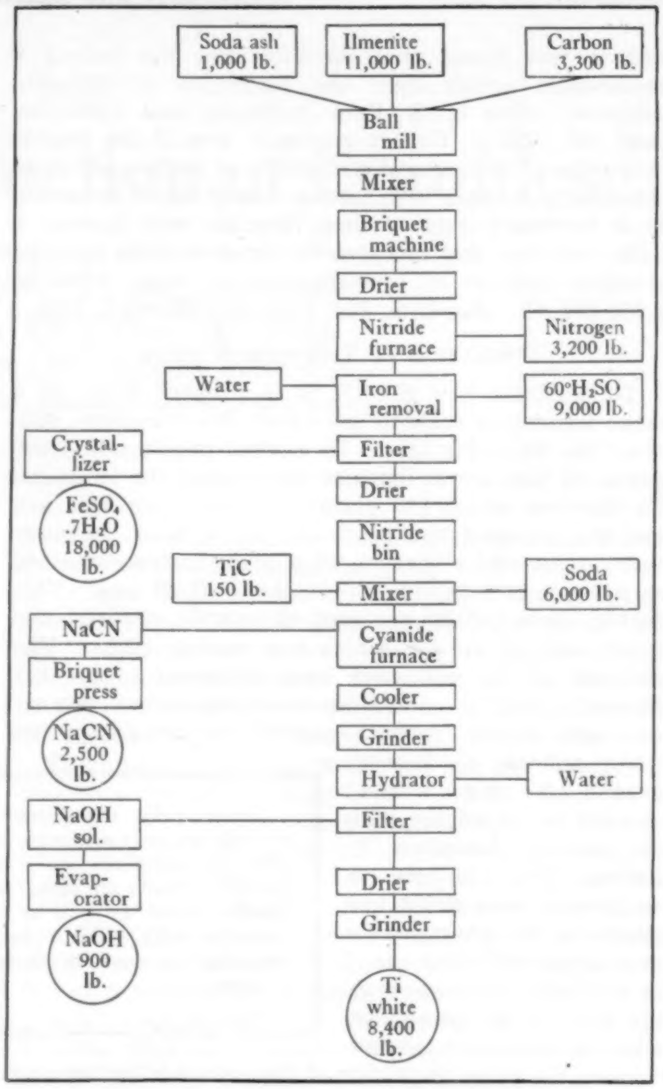
was still very slow and we were unable to obtain any thing like quantitative approach to the equation given in the patent. The use of the light lampblack was abandoned in favor of some heavier form of carbon which, in order to avoid introducing impurities into the cyanide, must be nearly ashless. It was while studying over this problem that the idea occurred to us to try carbon dissolved in metals. Cast-iron filings, in which part of the carbon exists as graphite, part as iron carbide and the remainder as free carbon, was such a material, and while it was probable that the iron might destroy any cyanide formed, still it was decided to give it a trial. We were agreeably surprised to discover that very much better yields were obtained than had heretofore been possible. (See U. S. Pat. 1,417,-702, May 30, 1922.)

There followed a number of experiments with these filings with and without the addition of carbon, the results of which convinced us that the ferric carbide contained in the iron was responsible for the greater part of the cyanide formation. If this were a fact, then other carbides might have a similar effect. This hypothesis was tested out with calcium carbide and highly satisfactory results were obtained. In order to determine the limits of this carbide action an experiment was undertaken with silicon carbide, titanium nitride and soda as the reactants. Since SiC, as is well known, is only slowly attacked by alkali carbonates, no results were expected, but contrary to all expectations a fine test for cyanide, by the well-known prussian blue method, was obtained. Aluminum carbide likewise gave similar results, and it therefore appears that this is a new and characteristic reaction of the carbides. (See Brit. Pat. 190,390, issued in 1922.) It was therefore decided to submit these reactions to a quantitative investigation. In brief, our results were as follows:

When titanium nitride is heated with titanium carbide and soda ash, the reaction goes to theoretical completion at temperatures below the melting point of the soda providing sufficient time be given and stirring be employed. The reaction products, apart from the theoretical quantity of sodium cyanide, are a previously undescribed sodium compound of Ti_3O_5, with the formula $Na_4Ti_3O_7$ or $(Na_2O)_2.Ti_3O_5$ and carbon monoxide gas. (See U. S. Patent Application 643,440.) If the fusion be carried out at 1,100 deg. C., the reaction goes quite rapidly and with considerable foaming and another new compound, $Na_2Ti_3O_6$ or $(Na_2O).Ti_3O_5$, is formed, the latter being non-volatile.

Problem of Recovery

Both of these new compounds undergo hydrolysis, forming in both cases sodium hydroxide and another quite stable compound, $Na_2Ti_6O_{11}$ or $Na_2O.(Ti_3O_5)_2$. This hydrolysis puts a serious obstacle in the way of extracting the cyanide with water. We have therefore decided to abandon this extraction procedure in favor of the simpler method of distillation which our experiments have indicated to be most feasible. Sodium cyanide is volatile at 1,500 deg. C. (Ingold, *J. Chem. Soc.*, 1923, vol. 123, p. 885), but can be carried off at a much lower temperature providing a current of nitrogen be flowing through the furnace. (Phillips, *Chem. & Met.*, 1920, vol. 22, p. 313.) Such a procedure and reaction can be best carried out in an electric furnace equipped with a condensing chamber, from which the cyanide may be drawn, and a cyclone dust collector to retain the smaller



Flow Sheet of Cyanide Process

particles of cyanide. In the arc, or electrode, chamber there must be kept a considerable pool of molten titanite, upon the surface of which, in order to avoid excessive foaming, the mixture of carbide, nitride and soda shall fall. If calcium or barium carbide is used, no foaming takes place, but the resulting titanite is harder to purify. The molten titanite, however obtained, is tapped off from time to time from the furnace and chilled. It will be found to be a bluish colored material that takes up oxygen quite readily, being thereby converted into the corresponding titanate. Upon treating this chilled furnace melt with water it hydrolyzes into sodium hydroxide and the insoluble sodium hexatitanite. This is an advantage, for by simply heating the resulting paste one causes the hydroxide to bring into solution silicon or aluminum compounds, present as impurities, and then by filtering off the soluble products one obtains, as a cake that only needs to be dried and ground, practically chemically pure sodium hexatitanate.

Summary of the Process

Now let us sum up what has been accomplished. The cheap mineral ilmenite has been easily converted into titanium nitride and iron and the latter into copperas, worth as much as the original ilmenite, while from the titanium nitride there has been obtained pure sodium cyanide and a quantity of a high-grade white titanium product in excess of half the weight of the original

ilmenite. To produce these there has been employed (besides ilmenite) carbon, nitrogen, sulphuric acid and soda ash, all cheap and readily available, and also energy in the form of heat and electric current.

In order that one may be able to gather a clearer idea of the process, a flow sheet of the method for manufacturing sodium cyanide and a white titanium compound from titanium cyanonitride is shown, in which the quantity of materials required per ton and a quarter of cyanide is given. Because of the fact that the process is as yet only upon a large-scale laboratory operation, no cost data are included, that being left for the reader to calculate from the figures given and from the conditions prevailing in his own locality. In our own calculations we assume the cyanide to have a factory value of 10c. and the byproduct white a works value of 5c. per pound. Under these assumptions the process would yield excellent returns.

Uses for Titanium Compounds

At the present time these titanium white products would find their principal use as pigments, in which field, by reason of their great covering power, their non-chalking, their resistance toward light and all chemical agents and their light weight, they could successfully compete with the lead and zinc whites. Our white sodium hexatitanate product being completely soluble in hot 60 deg. Bé. sulphuric acid, it is possible to use this solution as a starting point in the manufacture of other valuable titanium products. And if past experience is any criterion, new and unsuspected uses will be found for such titanium compounds as soon as they appear upon the market in quantity.

The process then is essentially a "byproduct method" of great flexibility whereby, from many kinds of nitrides and carbides, we can produce cyanides, ferrocyanide, hydrocyanic acid, etc. But for development work we prefer to employ the more easily prepared titanium compounds.

It is our hope, therefore, to be able to extend this study, begun in the laboratory, to fields of commercial practice and to produce simultaneously new as well as well-known titanium compounds, together with the cyanogen chemicals, and thus introduce into the technology of cyanide preparation a method whereby the cost of cyanogen compounds may be reduced and whereby, at the same time, the field of usefulness of the titanium compounds may be greatly extended.

Straw in the Chemical Industry

The straw of the small grains, wheat, oats, barley, rye and rice, and of buckwheat and flax and the stalks of corn offer a large field for experimentation along chemical lines, according to William A. Taylor, Bureau of Plant Industry, U. S. Department of Agriculture. Enormous quantities of these various kinds of straw and corn stalks are produced annually in the United States. Corn is grown on more than 100 million acres, and the small grains and flax on more than 100 million more. These must average at least a ton of straw or stalks to the acre, producing, therefore, on this basis more than 200,000,000 tons of plant material, some portion of which is potentially available for use in manufacturing processes.

Straw and corn stalks are now used principally for feed and as manure. In the main their use in this way is essential to the maintenance of productivity. In some parts of the country, however (where livestock is not kept in large numbers and where the use of manure is not profitable), they are burned. A large part of the total production is destroyed in this way. Recent experiments indicate that this material is worthy of attention by the chemical engineer. It has been shown that gas for heat, light and power can be made from straw by destructive distillation. Furfural also has been made from certain of these plant products. Further experimentation will doubtless reveal other products of importance.

A ton of straw contains 16 to 20 lb. of potassium. Under certain circumstances, the ash left from burned straw might be collected and used as a source of potash.

The cost of handling and transporting these bulky products makes it impractical to ship them long distances. The paper factories, which use about 150,000 tons of straw annually for making wrapping paper and strawboard, manufactured products relatively low priced, consequently are located near the sources of supply. Higher priced products would permit the location of factories in grain-producing regions in which the straw is now destroyed.

Conversion of Clays to Aluminum Sulphate

In connection with the development of a simple cheap process of preparing pure solutions of aluminum sulprate, work has been undertaken by the Department of the Interior at the Pacific Experiment Station of the Bureau of Mines on sulphating clays by various methods. Sulphate roasting, using gases containing varying amounts of sulphur dioxide to sulphate the aluminum silicate of the clays, proved impracticable, but favorable results were obtained by treating the clays with sulphuric acid. A wide series of aluminum silicate products was treated at various temperatures with differing strengths of acid. In general, nearly all the silicates were decomposed with fair efficiency at temperatures up to 200 deg. C. and with acids containing 50 to 70 per cent sulphuric acid. The easiest silicate to decompose was bentonite, but many of the kaolins were quite easily attacked. Feldspars are much more resistant. These experiments are being conducted by G. S. Tilley, assistant physical chemist.

Seek Elimination of Glass Pot Trouble

Probably one of the most annoying sources of trouble to manufacturers of commercial glass on a large scale is the lining of the glass-melting tanks. Very frequently these linings fail through corrosion after 10 to 14 months service. This results in a considerable loss of time and money. A life of 20 to 24 months for such a lining is not considered an unreasonable service to expect. Since the need for better tank refractories is so generally felt, the Bureau of Standards has determined to conduct an investigation covering the various typical brands now used to determine, if possible, the relation between refractory composition, conditions of service and life. In order to get the investigation under way twenty-seven small tanks have been made, using refractories which are typical of dense and open-burned aluminous and siliceous brands, as well as brands of medium composition. These will be subjected to the corrosive action of a soda-lime glass at high temperatures and the reactions obtained will be correlated, if possible, with the various types of refractories used.

Fundamental Principles of
Multiple Effect Evaporation

A Monumental Contribution of Basic Information Bearing on Evaporator Design and Operation—A Searching Study of the Problem of Evaporating Waste Sulphite Liquor

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THERE is such widespread misconception of the functions of a multiple effect evaporator that in order to clarify these it will be the purpose of the writer to take up the principles involved and to illustrate the method of attacking an evaporation problem by giving a specific example—viz., evaporation of waste sulphite liquor.

What are the fundamental considerations in evaporation? Here are at least the more important:

1. Temperature spread.
2. Individual temperature differences (including rise in the boiling point).
3. Static head of liquor over heating surfaces.
4. Viscosity of liquor at different concentrations and at different temperatures.
5. Velocity of liquor over heating surfaces.
6. Specific gravity.
7. Boiling point.
8. Prevention of corrosion.
9. Temperature level and heat conductivity.
10. Sequence in evaporation.
11. Elimination of condensation.
12. Elimination of entrained air and non-condensable gases.
13. Elimination of steam from liquor so as to avoid foaming.
14. Keeping conducting surfaces wet.
15. Keeping surfaces free from incrusting matter.
16. Mechanical construction.
17. Number of effects.

TEMPERATURE SPREAD

Temperature spread in an evaporator is the difference in temperature of the initial steam and the final steam going to the condenser. In designing an evaporation plant the chemical engineer is often called upon to design an evaporator that will fit in with existing conditions in the mill—viz., the condensing water may be limited in amount, or it may rise to a high temperature during certain seasons of the year, or the steam available may be at low pressure, or there may be a limit to which the substance can be heated or a limit to which the liquor may be cooled, and there may be many other considerations which will readily occur to you all.

> **EVAPORATION**
>
> **Here is an unusually valuable article on one of the most important of the so-called unit processes of chemical engineering. In it a distinguished engineer deals with the fundamentals of this process in such a way as to contribute useful information to production men in every industry that faces an evaporation problem.**
>
> ***A UNIT PROCESS OF CHEMICAL ENGINEERING***

If the condenser water goes to 85 deg. F. in the summer, you have limited the temperature of the steam going to the last effect to 25 deg. above the limit if the condenser water is 60 deg., other things being equal. (This is a general statement, however, for there may be limitations on the vacuum pump which may modify this to a certain extent.) If the amount of condensing water is limited, you may have to heat it hotter than you would like and a temperature limit is again set below which you cannot go. On the other hand, you may have live steam or exhaust steam, and so you may be limited on this end also.

Thus assume two cases, one with initial steam at 100 lb. gage pressure, and steam to the condenser at 2 in. absolute pressure, and the other having the initial steam at 5 lb. gage pressure, with vapor going to the condenser at 6 in. absolute pressure. In the first case there is a possible temperature spread of 228 deg. F., while in the second case the spread is only 88 deg. F. It will be seen from the above that the engineer may be seriously handicapped from the start. For in the first case he could use large temperature differences between effects, and a small evaporator or more effects with a small temperature difference. In the latter case he must confine himself to a very few effects with a large temperature difference, or if he increases the number of effects, the temperature difference between them will have to be so exceedingly small that he will require an evaporator of enormous size. This must be so self-evident that no further attention will be given this phase of the subject and we shall pass on to that phase of the subject in which the allowed temperature spread may be the same. Under these conditions the greatest economy will be in that evaporator which utilizes the least part of this allowed temperature spread, other factors of course assumed to be equal. To illustrate this point two charts, Figs. 1 and 2, are printed herewith which are calculated on a theoretical basis, all factors considered equal with the exception of the temperature spread, which is, of course, governed by the individual temperature difference. In these

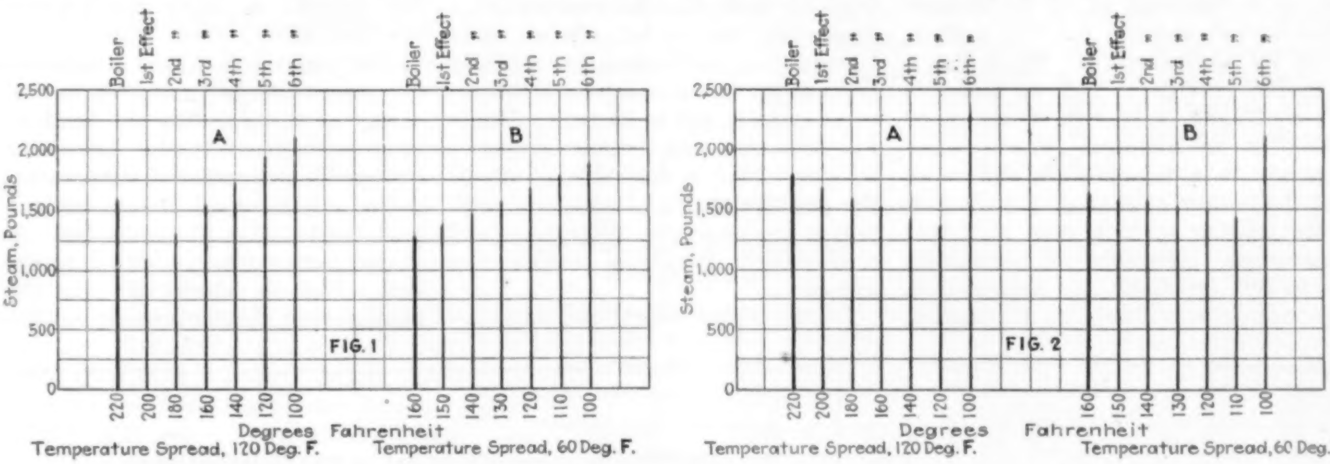
Adapted from a paper read before the American Institute of Chemical Engineers at Washington, D. C., Dec. 5, 1923.

charts loss by radiation will not be taken into consideration; first, because this factor is largely within individual control, and second, because this is governed by too many factors to be considered in a general discussion of the principles of evaporation, in which size, surrounding temperatures and the individual temperatures of each effect, etc., are not considered; though, of course, it will be readily seen that the lower the average temperatures the lower is the heat lost from this cause. What we wish to show is that if by some means or other we can get a higher heat conductivity per square foot of heating surface and thus lower the individual temperature differences and thus the total temperature spread, we can with the same size of evaporator, other things being equal, obtain a greater economy in that evaporator which has the lowest temperature spread. It should also be stated that as in this discussion we are to consider several variables and that as inasmuch as the only way to see the effect of any one variable is to keep all the others constant, unless specifically mentioned it must be understood that the above method will be adhered to.

Let us assume as a basis 1,000 lb. of solids the specific heat of which is 0.5, in a water solution such that the percentage of solids will be 8.54 per cent, that the temperature of the liquor is 160 deg. F., the number of effects six, the temperature spread allowed 120 deg., with the steam going to the condenser at 100 deg., and concentration to 50 per cent. Rise in boiling point or radiation will not be taken into consideration and as tabular data for calculation of the charts would consume much space, only those absolutely essential will be included. In Fig. 1 is shown (*A*), forward or parallel flow evaporation, using a temperature difference of 20 deg. F., (*B*), the same with a temperature of 10 deg. F. In Fig. 2 is shown (*A*), backward or counter-current flow with a temperature difference of 20 deg. F., and (*B*), the same with a temperature difference of 10 deg. F.

A study of these charts will show that by decreasing the temperature spread from 120 to 60 deg. we have raised the ratio of water evaporated to steam used from 6.18 to 7.67 in the case of parallel evaporation, and 5.49 to 6.02 in counter-current evaporation. It will also be noticed that the steam to the condenser is decreased in both cases.

In the above theoretical examples we have assumed a uniform temperature difference of 20 deg. F. in *A*, Fig. 1 and Fig. 2, and a uniform temperature difference of 10 deg. F. in *B*, Fig. 1 and Fig. 2. Such uniform temperature differences rarely, if ever, occur in actual practice and the charts are submitted only to show a principle which every engineer must take into consideration, if he is to design an evaporator which will operate at the greatest efficiency.



Figs. 1 and 2—Showing Effect of Decreasing Temperature Spread With Uniform Temperature Differences

Individual Temperature Differences

In order to reduce the total temperature spread, it is self-evident that we must reduce the individual temperature differences between the heating steam on one side and the liquor undergoing evaporation on the other side. The first natural impulse is to say this should be done by increasing the heating surface. Unfortunately, the solution does not lie with so simple a remedy, for by doing so you increase the first cost, increase the cost of maintenance and repairs, and increase radiation losses and fixed charges, to say nothing of the chances of increasing leaks and the cost of labor. We naturally have no other course when we are dealing with large capacities in comparison with small capacities, but what we are primarily interested in is the greatest efficiency at the minimum cost.

How to Eliminate Static Head

The first of all requisites is to get rid of static head. In evaporators of small capacity this subject may not assume great importance, though even there it may be appreciable. Let us assume that the pressure in the last effect is 2 in. absolute or 28 in. vacuum.

Let us assume, for instance, that in the last effect we have a static pressure equivalent to 1 in. of mercury over the lowest part of the heating surface. This static head amounts to 1.13 ft. of water and corresponds to a difference of 14 deg. F. in temperature, the difference between 2 in. absolute pressure and 3 in. absolute pressure. It will readily be seen that if only 10 deg. F. difference of exchange is used, under these conditions hardly any heat at all will be transmitted through the lower heating surface, because the static head of 1.13 ft. of water raises the boiling point 14 deg., while we have only 10 deg. leeway and the only heat transmitted is that used in heating the liquor. In fact, if we stick to 10 deg. difference of exchange we find that only 0.79 ft. of water will correspond to a static head of 10 deg. In most solutions, however, we have a liquor of a much higher specific gravity than water. Let us assume a spe-

cific gravity of 1.3; then we find that 0.61 ft. of this solution will correspond to 10 deg. of temperature difference. Now if this difference of 10 deg. is to be maintained, we find that the depth of the bottom heating surface can be only 7.3 in. below the surface of the liquor, with the bottom heating surface hardly functioning at all. If large capacities are to be obtained, the only way of obtaining such is to increase the length and breadth, which means costly construction subject to mechanical weaknesses, with an enormous increase of radiating surface, or we may increase the heating surface by increasing the number of units, a procedure which is in its effect the same as in the first alternative.

Now let us suppose that the capacity has to be so large as to require a difference of 12 ft. between the bottom and top heating surface, and let us assume the liquor has a specific gravity of 1.3; we find this is equivalent to 15.6 ft. of water, or 13.8 in. of mercury, which corresponds to a temperature difference at the bottom of 81 deg. F.; the bottom heating surface, even with this enormous difference of exchange, scarcely functions in evaporation, though it may heat the circulating liquor, and we find the static head has made in this effect alone a difference of more than eight effects. Again, this temperature difference of 81 deg. F. corresponds to 15.8 absolute pressure, inasmuch as we have assumed an absolute steam pressure to the condenser of 2 in. absolute (28 in. vacuum, barometer 30 in.), which corresponds to a temperature of 100 deg. F. Now let us again, on the preceding effect, assume a static head of 12 ft. with a specific gravity of 1.25. We then have an absolute pressure of 29.1 in. (0.9 in. vacuum, barometer 30 in.), or a boiling point at the bottom heating surface of 211 deg. F., and we have lost 30 deg. F., corresponding to three effects of 10 deg. temperature difference each, and yet only two effects have been used. These illustrations show that in evaporation a large unit may be less efficient than a small unit, and thus quite different from most operations where the reverse is more apt to be true. Hence it will be seen that the elimination of all static head is desirable as one of the positive means of reducing individual temperature differences and consequently the total temperature spread.

In the above charts we have assumed a constant temperature difference, but such rarely occurs in practice—first, because most liquids tend to increase in viscosity, and second, because the amounts of heat transferred in different effects vary. The more viscous the liquor the less is its conductivity, as a rule. The reason for this is that most liquids are poor conductors of heat and that most of the heating of such is accomplished by heating the individual molecules. The greater the number of molecules coming in contact with the heated surface the greater is the heat transferred. The more viscous the solution the less is the transfer of heat, for the number of molecules coming in contact with the heated surface in a given time diminishes with increasing viscosity. Most solutions, however, tend to become less viscous as their temperatures are increased; from this fact it would appear that an evaporative process should be conducted in such a way as to neutralize the tendency to greater viscosity due to concentration by an increased temperature, unless other considerations make it inadvisable. To illustrate how the viscosity may change with temperature, Fig. 3 shows a viscosity-temperature chart of waste sulphite

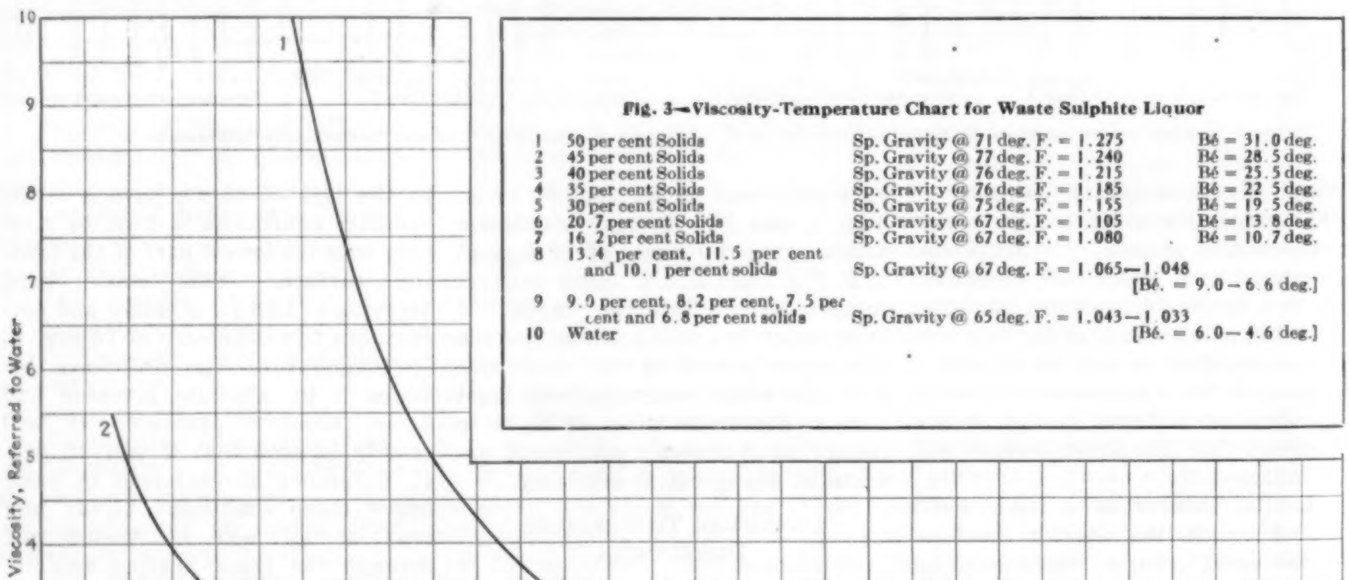


Fig. 3—Viscosity-Temperature Chart for Waste Sulphite Liquor

1	50 per cent Solids	Sp. Gravity @ 71 deg. F. = 1.275	Bé = 31.0 deg.
2	45 per cent Solids	Sp. Gravity @ 77 deg. F. = 1.240	Bé = 28.5 deg.
3	40 per cent Solids	Sp. Gravity @ 76 deg. F. = 1.215	Bé = 25.5 deg.
4	35 per cent Solids	Sp. Gravity @ 76 deg. F. = 1.185	Bé = 22.5 deg.
5	30 per cent Solids	Sp. Gravity @ 75 deg. F. = 1.155	Bé = 19.5 deg.
6	20.7 per cent Solids	Sp. Gravity @ 67 deg. F. = 1.105	Bé = 13.8 deg.
7	16.2 per cent Solids	Sp. Gravity @ 67 deg. F. = 1.080	Bé = 10.7 deg.
8	13.4 per cent, 11.5 per cent and 10.1 per cent solids	Sp. Gravity @ 67 deg. F. = 1.065—1.048	[Bé. = 9.0—6.6 deg.]
9	9.9 per cent, 8.2 per cent, 7.5 per cent and 6.8 per cent solids	Sp. Gravity @ 65 deg. F. = 1.043—1.033	[Bé. = 6.0—4.6 deg.]
10	Water		

liquor. The values are obtained from a Stormer viscosimeter. It will be noted from this chart that the viscosity of waste sulphite liquor up to 29 per cent varies little from that of water, and that an increase of temperature decreases the viscosity only slightly. When, however, we come to deal with a 50 per cent waste sulphite liquor, we find that the viscosity is many times greater than either water or sulphite liquor of concentrations less than 30 per cent, while at high temperatures it may be only four times that of these other liquids. The logical course of evaporation of this liquor, provided we do not have other interfering considerations, would be to have the concentrated liquor emerge from the evaporator which is at the highest temperature.

Velocity Over Heated Surfaces

It is a well-known fact that with increase in velocity over the heated surface we get an increase in heat transfer. The laboratory of the Brown Co. has already made a contribution on this subject. (G. A. Richter, *Trans.* Amer. Inst. Chem. Eng., 1919, vol. 12, Part II, pp. 147-79.) We must consider this factor when we come to evaporator design. Especially is this true when the liquor is so viscous that the only way of getting a high heat conductivity is to get a high velocity over the heated surfaces.

Specific Gravity—The same considerations which we have taken into account in relation to viscosity and velocity apply in many cases to specific gravity. Thus a highly attenuated gas, such as steam in the last effect of an evaporator (vacuum end), will move a light, mobile body over the heated surfaces much faster than a heavy viscous body, and as before stated, the greater the velocity the greater the heat conductivity.

Boiling Point—The individual temperature differences may be greatly affected by the rise in the boiling point. A 50 per cent solution containing a substance of large molecular weight may not have as high a boiling point as a 25 per cent solution containing a substance of small molecular weight. Furthermore, the boiling point may be influenced by the kind of solution. If it is colloidal, the boiling point may not rise to the same extent as would be the case if we had a true solution. The knowledge of this is important, for this point alone may determine the nature of the evaporating process.

In order to avoid repetition, the effect of the rise in the boiling point on the process of evaporation will be discussed in connection with the prevention of corrosion of tubes.

Corrosion of Tubes

Certain liquors have an acid radical which is so lightly held that long-time contact with heated surfaces may liberate the radical with the tendency to corrode the tubes. In such cases the difficulty may be eliminated either by so conducting operations that the time element may be reduced to a fraction of a second, or a sufficient amount of alkali may be added to anticipate this dissociation. The deciding factors will be cost and quality of resulting product. We have two alternatives before us: we may feed each effect of a multiple effect evaporator from a common source so that weak liquor enters each evaporator and we may take a concentrated solution from each evaporator—that is, the liquor goes through each effect in parallel instead of going through them in series—viz., from one effect to another—or we may pass the liquor through all, neutralizing it enough in one operation or in proper stages. If the rise in the boiling point is large the first method may so increase the individual temperature difference, and thus increase the total temperature spread, as seriously to detract from the efficiency. It furthermore may defeat its own ends by raising the temperature in the first effects enough to neutralize the advantage sought. If the rise in the boiling point is low, we may adopt this method without serious loss in efficiency. If the liquor is of such a nature that neutralization will be detrimental, the parallel flow method may offer a way out of this difficulty.

EDITOR'S NOTE: Heat conductivity, temperature levels and temperature differences will be discussed by the author in a subsequent issue of *Chem. & Met.*

The Status of Research in Dye Industry

Of the 209 firms engaged in the manufacture of dyes and other coal-tar chemicals, 67 had separately organized research laboratories for the solution of technical problems and for the development or discovery of new products, according to the U. S. Tariff Commission's recent "Census of Dyes and Other Synthetic Organic Chemicals." The net operating expenses of these laboratories, together with research work done in the laboratories not separately organized for research, were $2,172,508. This includes salaries, apparatus and materials, after deducting the value of salable products made in the research laboratories. The figure for 1922 shows a decrease of $2,074,160 compared with that of 1921. This figure is doubtless an understatement of the real cost of experimental work, since it does not include, in all cases, the cost of research done as a part of manufacturing operations and not shown on the books of the companies as a charge against research.

The coal-tar chemical industry in the United States has expended $21,545,915 in research work alone, according to reports to the Tariff Commission, during the last 5 years (1917-1922); with the exception of the year 1917 this is net, and does not include the value of salable products made in the experimental department. The energetic and extensive investigations into the manufacture of dyes have been greater probably than in any other field of chemical research. The achievements of this period, 1917-1922—namely, the establishment of a large dye and synthetic organic chemical industry, with its early progress and developments—must be attributed in no small part to the enormous expenditures in research.

A large expenditure for research is essential if an industry is to be self-contained and placed on a stable, efficient basis of operation. Not only must the industry consider, as in the past, the production of products already in existence, but the development and discovery of new dyes, pharmaceuticals and other products are necessary if the industry is to develop and maintain a competitive position in the world's markets. The expenditures for research decreased during 1921, and still more so in 1922, because many concerns were obliged to retrench when business conditions were poor. While this no doubt retarded the progress of the industry to some extent, there were nevertheless advances made during that period and better progress may be expected during 1923.

Equipment News

From Maker and User

Recording CO or Other Combustible Content of Gases

Most Recent Type of Apparatus for This Work Operated by Recording Temperature Due to Complete Combustion of This Gas

OF THE various types of instruments placed on the market in recent months for recording the percentage of CO present in a gas, one of the most interesting is that manufactured by the Uehling Instrument Co., Paterson, N. J. This instrument is made as a separate instrument or as an adjunct to the CO_2 recorder.

The accompanying cut illustrates the separate type. *A* and *B* are platinum tubes of small bore, heated electrically, through which the gas being tested flows continuously. The gas enters through the inlet opening *E* and thence through the platinum tube *A*. If CO or any other combustible gas is present, it will burn within the heated tube *A* and increase the tube's temperature more or less, depending upon the amount of combustible present. Then the burnt out gas will flow through the platinum tube *B* and out of the latter under a fixed suction. The hotter the tube *A* becomes the more expanded will be the gas flowing through it and consequently less gas will enter chamber *C* as tube *A* becomes hotter. The outlet suction does not vary, hence a decreasing flow of gas through tube *A* results in a greater partial vacuum in chamber *C*. Thus the varying suction in chamber *C* becomes a measure of the heat units in the gas and by connecting chamber *C* with a recording gage *R*, by means of tubing *D*, the quantity of combustible can be recorded any distance away—for example, in the engineer's office. The recorder is calibrated in percentage of CO; however, if hydrocarbons or hydrogen are present, they will also be recorded in terms of CO or equivalent heat value. It is also feasible to calibrate the instrument in B.t.u. per cubic foot of gas.

The auxiliary indicator *I* is provided also, to be placed on the apparatus where the gas originates, as the furnace or boiler. It serves there as a guide for the operator so that he may get the best results from his work. *L* is a gap through which sufficient air is admitted to insure complete combustion at all times.

Either direct or alternating current may be employed, the current consumption being about 40 watts. The diagram shows the machine operating on a storage battery *J*, with a rheostat *F* in series. Even severe voltage variations have no effect on the accuracy of the instrument because both tubes are heated or cooled to the same degree by such changes and it is only a difference of temperature between the two that affects the suction in chamber *C*. Rheostat *G*, in shunt with platinum tube *B*, provides a means for raising or lowering the temperature of tube *B* a few degrees, which is a simple way of making any slight adjustment required in the initial setting.

When used independently of the Uehling CO_2 recorder, it is necessary to employ a suction regulator *H*. Tube *M*, which is open to the air, extends into the water almost to the bottom of the vessel. Exactly 6 in. above its lower end is the bottom of pipe *O*.

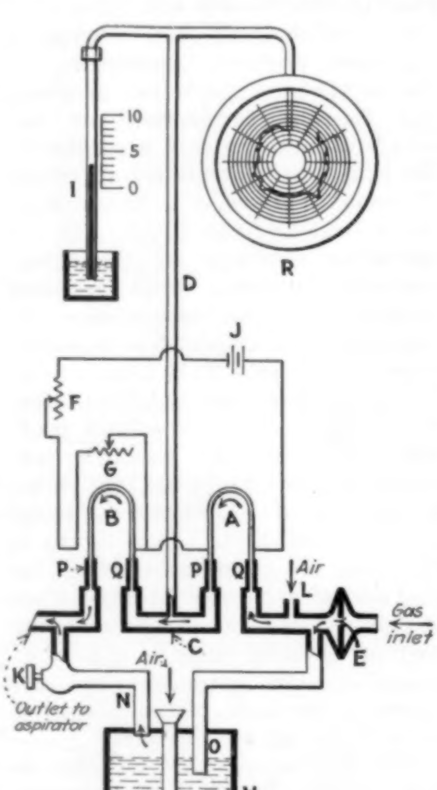


Diagram Illustrating the Construction of the Uehling CO Recorder

Part of the gas entering the instrument is bypassed through pipe *O*, bubbling up through the water in *H* and escaping through pipe *N*. This pipe communicates with an aspirator or main suction through needle valve *K*. The rate of flow depends upon the setting of *K*, which does not have to be exact, so long as it is open sufficiently to cause air to bubble from the end of pipe *M* and gas to bubble from the end of pipe *O*. Under these conditions, pipe *M* is completely filled with air, the water level at its submerged end being consequently at atmospheric pressure. Correspondingly the bottom of pipe *O*, which is 6 in. above the bottom of pipe *M*, is under a constant suction of 6 in. of water head. This suction is thus maintained constant all the way back to the first patinum tube *A*, regardless of any change in the tension of the gas on the inlet side of the opening *E*, caused by draft variations or otherwise.

Make-up water may be added weekly through tube *M*, the exact level of the water being immaterial so long as tube *O* is submerged. An arrangement similar to that used with standard Uehling CO_2 recorders is employed for creating the primary fixed suction at *S*. A steam, air or water aspirator, as preferred, can be supplied.

The gas line is protected against fouling and corrosion by the standard Uehling "Pyro-Porus" filtering, drying and desulphurizing system and the air leak *L* is also provided with an effective filter. The platinum tubes remain in perfect calibration indefinitely because the gas purifier removes all elements of an injurious nature.

The equipment is provided with glass covers for the platinum tubes, not shown in the diagram, and the platinum tubes are insulated by the glass tubes *P*, *Q*, through which the gas enters and leaves them. As will be noted, there are no moving parts and no chemicals are employed. The instrument is speedy in action, accurate and extremely sensitive, indicating as little as 0.1 per cent of CO or equivalent.

Hand Size Press for Vegetable Oils

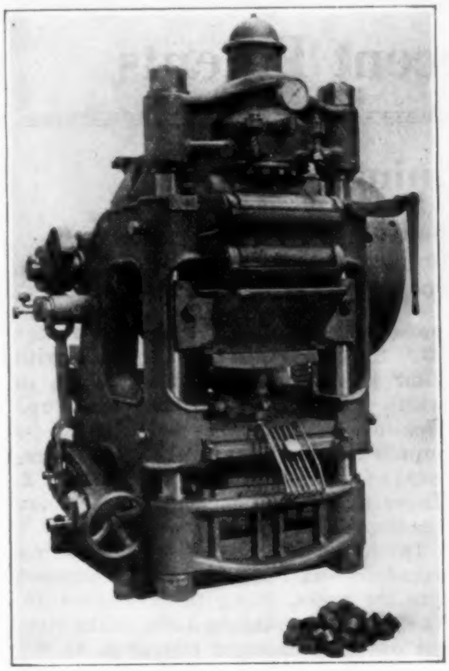
There are many situations where it is desired to extract vegetable oils near the source of supply because of the cheap labor and raw materials there available. To meet this situation in particular and the small press demand in general, Fred S. Carver, 8 West 40th St., New York City, has designed and placed on the market the press shown in the accompanying line cut.

This press, which has already been used for peanut oil, china wood oil, castor bean oil and coconut oil with successful results, is a hand-operated hydraulic press of the cage type. In this type, the material to be pressed is placed in a cylindrical cage. The press is supplied with the Carver patent filter plate, which does away with the use of filter cloth.

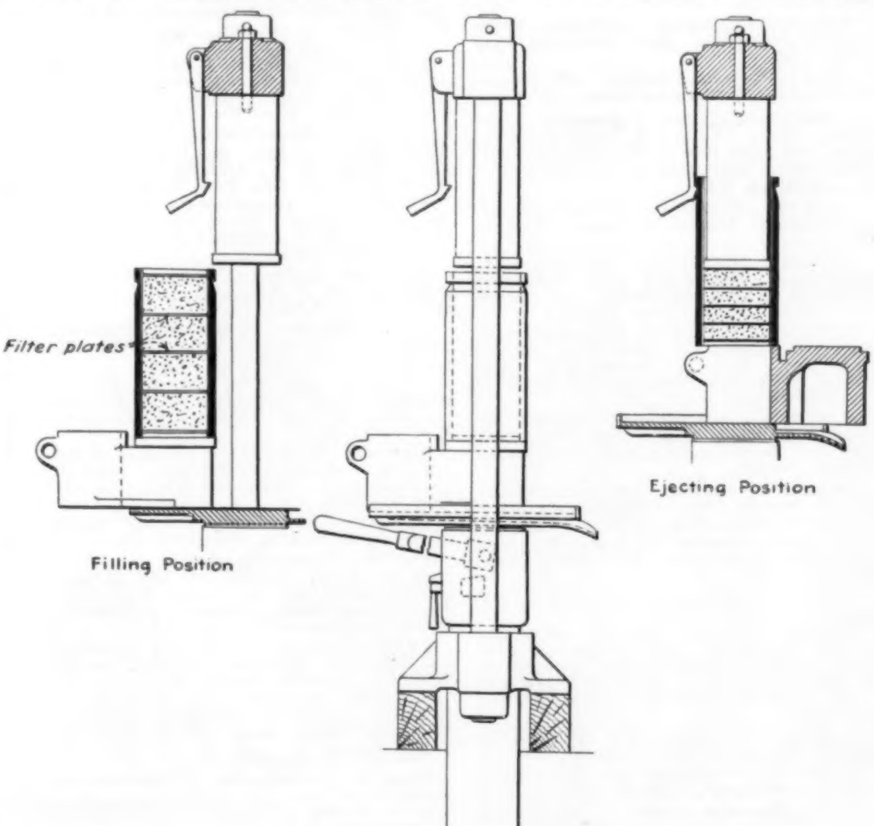
The method of operation may be seen quite clearly from the cut. The sliding base with the cage is slid forward to the filling position by the operator, and several layers of the meal, or pulp, to be pressed are put into the cage, with the filter plates dropped in between as indicated. The cage and its base are then slid into the pressing position. The operator then, by means of the lever, pumps the press up until the plunger, descending into the cage, squeezes the material; this compresses it, forcing out some of the oil, making room so that more layers of meal may be added. As he pumps the press up again against the full compressed charge, the oil in the material is forced through the filter plates and edgewise out through the centers of them to grooves in the side of the cage, thence out into the catch pan of the press. Then the operator turns a little lever which releases the pressure and lets the press back down of its own weight. As it descends, the cage, with the pressed cakes in it, is suspended by the latch indicated and the sliding base drops away from it enough so that it can be slid over to the "ejecting position" shown. The press is then pumped up so that the plunger pushes the cakes out of the cage.

As the press is backed down again, the cage is held by the latch so that the sliding base may be pulled back; the latch is then released, dropping the cage onto the base, which is slid over to "filling position" again. This leaves the cakes and the filter plates right in front of the operator, ready for the operation to be repeated. The pumping operation is an easy one, as the speed required is limited by the flow of the oil. This takes no time otherwise needed by the operator and one man can handle the press.

This press is supplied with either 7-in. or 9-in. diameter cage. The 7-in. size has 600 cu.in. net contents and gives 4,000 lb. per square inch pressure on the material. The corresponding figures for the 9-in. size are 1,000 cu.in. and 2,400 lb. per square inch pressure.



De Gama Briquet Press



The Carver Hand-Operated Hydraulic Cage Press

Improved Briquetting Equipment

Manufacturers of dry chemicals and similar materials who desire to put out their products in briquet form will be interested in the machine and process now beng introduced into this country by the American De Gama Process & Machine Corporation, 347 Madison Ave., New York City.

So far the equipment has been used only in the reclaiming of metal chip and its uses in other industries are only forecast. The metal reclaiming operation is novel and of interest. Using the machine shown in the accompanying cut, a quantity of amorphous material is squeezed together under a vacuum. To the resulting mass a final shock-pressure of 154,000 lb. per sq.in. is applied. This results in the formation of a metal briquet of a density almost equal to that of the cast material. When heating during the process of melting it will not disintegrate and because of the greatly decreased surface of the melting metal which is thus exposed, the losses that occur from oxidation and volatilization when metal chips are melted in the original form are greatly reduced.

Catalogs Received

UEHLING INSTRUMENT CO., 473 Getty Ave., Paterson, N. J.—Bulletin 150. A description of the combined barometer and vacuum recorder for checking steam turbine and condenser performance.

RUMSEY PUMP CO., LTD., Seneca Falls, N. Y.—Booklet DL-24. A booklet entitled "Some Engineering Applications of Rumsey Pumps," which shows some of the uses of Rumsey hand and power pumps.

AMERICAN ELECTRIC MOTORS, INC., Milwaukee, Wis. A folder describing the inclosed, semi-inclosed, open and back-geared motors made by this concern, with some suggestions as to various uses.

WESTINGHOUSE ELECTRIC & MANUFACTURING CO., East Pittsburgh, Pa.—A bulletin describing the new model design of Westinghouse Underfeed Stoker, called the Multiple Retort Underfeed Stoker.

WELLMAN-SEAVER-MORGAN CO., Cleveland, O.—Bulletin 78. A catalog describing the construction and use of the W-S-M Revolving Car Dumper for removing loose material from open top railway cars.

MONARCH MFG. WORKS, INC., Philadelphia, Pa.—A leaflet on the "Monarch" brass spray nozzles for air washers and similar equipment.

D'OLIER CENTRIFUGAL PUMP & MACHINE CO., 165 Broadway, New York City.—Bulletin 126-3. A bulletin describing some of the large sizes of centrifugal pumps made by this company.

WESTINGHOUSE ELECTRIC & MANUFACTURING CO., East Pittsburgh, Pa.—Circular 1692. A catalog entitled "Westinghouse Marine Log," which is a very interesting and well-illustrated 90-page book on the uses of Westinghouse equipment in marine fields.

Review of Recent Patents

Petroleum Refining Practice

Investigations by the Technical Staff of the Standard Oil Co. of Indiana Have Developed an Improved Wax Press and a New Byproduct Sulphonic Acid

HARRY F. GLAIR and Edward J. Wonnacott, of Whiting, Ind., describe in Patent 1,474,899 (issued Nov. 20, 1923, and assigned to the Standard Oil Co. of Indiana) an improved filter press for the separation of paraffine wax from a suspension of the wax in chilled oil.

The essential elements of the press are arranged as shown in Fig. 1. Rings 16 separate the annular disks of perforated metal 18, which serve as supports for the filter cloths 19. These are sewed together around the central opening, as indicated at 21, and also have an opening in the center, forming a channel through which the oil reaches each filter element. Filtered oil leaves the press through the drainage openings 23. Spacing rings 24 alternate with filter leaves to form chambers 26, in which the wax cakes are built up. Heating and cooling media may be supplied through pipes 27, the arrangement of which is more evident in Fig. 2. These pipes are connected to common headers above and below the press.

In operation, chilled oil containing paraffine wax in suspension is pumped into the press, filling the chambers 26. The oil passing through the cloths runs out of the bottom of the press to the oil outlet pipe shown at the lower left, Fig. 2. As soon as the spaces 26 become substantially filled with slack wax the supply of chilled oil is cut off. Steam is then admitted to the coils 27, melting the wax, which then flows through the filter cloths and out the openings 23. The position of the guiding plates below the press has been changed in the meantime so that the wax flows to the trough under the center of the press, where a screw conveyor serves to remove it. After the wax has been removed from the press, chilled oil may be immediately introduced, as in the manner above described, in which case the oil which is initially passed through and which serves to chill the press must be again chilled and passed through the press, or the press may be initially cooled by passing cold oil preferably filtered, through the coils.

A New Sulphonic Acid From Petroleum

A new water-soluble petroleum sulphonic acid is described by Robert E. Humphreys, Francis M. Rogers and Oscar E. Bransky, of Whiting, Ind., in Patent 1,474,933, granted Nov. 20, 1923, and assigned to Standard Oil Co. of Indiana.

In the treatment of petroleum oils,

American Patents Issued December 4, 1923

The following numbers have been selected from the latest available issue of the *Official Gazette* of the United States Patent Office because they appear to have pertinent interest for *Chem. & Met.* readers. They will be studied later by *Chem. & Met.'s* staff, and those which, in our judgment, are most worthy will be published in abstract. It is recognized that we cannot always anticipate our readers' interests and accordingly this advance list is published for the benefit of those who may not care to await our judgment and synopsis.

Reissue 15,227—Vitreous Product and Process for the Manufacture Thereof. Percy Broadbent Crossley, Calcutta, India.

1,475,929—Machine for Washing Edible Animal Tissues. Henry B. Buckham, Chicago, assignor to Allbright-Nell Co., Chicago.

1,475,938—Method of Coloring Citrous Fruits. Frank E. Denny, Los Angeles, Calif., dedicated to the citizens of the United States.

1,475,959 — Double - Superphosphate Process. Herbert H. Meyers, Pittsburgh, Pa., assignor to Armour Fertilizer Works, Chicago.

1,475,973—Process of Electrodeposition. Bertrand S. Summers, Port Huron, Mich.

1,475,976—Process of Making Ferrophosphorus. Joseph Warner, Nashville, Tenn.

1,475,995—Chemical Conversion of Substances. Leonhard Heis and Hubert Jezler, Zurich, Switzerland.

1,476,016—Composition of Matter for Coating Surfaces. Charles A. Keedwell, New York City.

1,476,032—Apparatus for Defiberizing Wood. Gustav Aicher and Uel S. McMillan, San Francisco, Calif., assignors to McMillan Process Co., San Francisco.

1,476,061—Apparatus for Exchanging the Heat of Liquids. Francois Duvieusart, Santiago, Chile.

1,476,091—Process of and Apparatus for the Manufacture of Lower-Boiling Hydrocarbons From Higher-Boiling Hydrocarbons. Almer M. McAfee, Port Arthur, Tex., assignor to Gulf Refining Co., Pittsburgh, Pa.

1,476,142—Furnace. Grant D. Bradshaw, Pittsburgh, Pa.

1,476,143—Dry Pan. Davis Brown, Bucyrus, Ohio, assignor to Hadfield Penfield Steel Co., Bucyrus.

1,476,152—Recovery of Sugar From Sugar-Cane Mud. Elie Delafond, Havana, Cuba.

1,476,153—Crystallization of Sugar. Elie Delafond, Havana, Cuba.

1,476,192—Method of Casting Light Metal Alloys. William R. Veazey, Cleveland, Ohio, and Edward C. Burdick, Midland, Mich., assignors to Dow Chemical Co., Midland, Mich.

1,476,204—Method of Shrinking Animal Casings. Edwin G. James, Chicago, Ill.

1,476,217—Haired and Unhaired Hide Stretching, Ensuppling and Trimming Machine. Theophile Pernin and Joseph dit Georges Klotz, Paris, France.

1,476,219—Process of Distilling With Catalytic Chemicals. George L. Prichard and Herbert Henderson, Port Arthur, Tex., assignors to Gulf Refining Co., Pittsburgh, Pa.

1,476,226—Waterproofing Process for Textile Fabrics, Paper and Such Materials. Raoul Adrien Grimoin-Sanson, Oissel, France.

1,476,235 — Method of Generating Mixed Gas in Twin Generators. Werner Alfred Paul Berg, Kobe, Japan.

1,476,242—Process of Sugar Refining and Manufacturing. Roy D. Elliott, Crockett, Calif.

1,476,251—Electrolytic Cell. Royal S. Handy, Kellogg, Idaho.

1,476,283—Process for the Manufacture of Ammonia. Ivar Walfrid Cederberg, Lidingo-Brevik, near Stockholm, Sweden, assignor to Norsk Hydro-Elektrisk Kvaelstofaktieiskab, Christiania, Norway.

1,476,284—Method of Electrolysis. Farley Granger Clark, Toronto, Ont.

1,476,292—Gas-Purifying Apparatus. Albert L. Galusha, Sharon, Mass.

1,476,303 — Electrolytic Apparatus. James Norman Smith, Toronto, Ont.

1,476,330—Process of Adding Hydrogen. Carleton Ellis, Montclair, N. J.

1,476,331—Vacuum Pan. Godfrey Engel, Sr., Brooklyn, N. Y., assignor to Buffalo Foundry Machine Co., Buffalo, N. Y.

1,476,374—Electrodeposition of Rubber Coatings. Samuel E. Sheppard and Leon W. Eberlin, Rochester, N. Y., assignors to Eastman Kodak Co., Rochester.

1,476,381—Pneumatic Tire and Method of Making the Same. Harlan L. Trumbull, Akron, Ohio, assignor to B. F. Goodrich Co., New York City.

1,476,421 — Transportable Muriatic Acid Tank. Jasper M. Rowland, Niagara Falls, N. Y., assignor to Hooker Electrochemical Co., New York City.

1,476,424 — Circulation - Regulating Means for Driers. Frederick G. Sargent, Westford, Mass., assignor to C. G. Sargent's Sons Corporation.

1,476,431—Method of Melting Glass in Pots. Frank E. Troutman and Charles H. Christie, Butler, Pa.

1,476,432—Glass-Melting-Pot Furnace. Frank E. Troutman and Charles H. Christie, Butler, Pa.

1,476,448—Apparatus for and Method of Hardening or Tempering Wire. Charles O. Johnson and Charles D. Johnson, Worcester, Mass.

1,476,523—Process and Apparatus for Feeding Sulphur to Burners. Herbert Duglass Kerr, Riccarton, Christchurch, New Zealand.

1,476,524 — Byproduct Coke Oven. Zareh H. Kevorkian, Fairfield, Ala.

1,476,530—Flotation of Ores and Materials Therefor. Erwin W. McCullough, Indianapolis, Ind., and Roger E. Wilson, Minneapolis, Minn., assignors to Peter C. Reilly, Indianapolis.

1,476,562—Rendering Paper Material and the Like Grease- and Water-proof. Wilbur L. Wright, Fulton, N. Y.

1,476,645—Recovery and Refining of Sulphur. Charles Stanley Robinson, Somerset West, Cape of Good Hope, South Africa.

Complete specifications of any United States patent may be obtained by remitting 10c. to the Commissioner of Patents, Washington, D. C.

particularly the heavier fractions, with fuming sulphuric acid to produce the highly refined products marketed as lubricants and as medicines for internal use (liquid paraffine), it has been known that there is produced a considerable quantity of sulphonic acids soluble in the oil under treatment. These oil-soluble acids, which by reason of their color are known to the trade as mahogany acids, have been separated from the oil, purified and put to various industrial uses.

It has now been found that another distinct group of acids separates out in the sludge layer, being more soluble in water than in oil. The new acid, which by reason of its color is distinguished as green acid, is obtained in the following manner:

The mineral oil under treatment—for example, a lubricating stock from mid-continent crude petroleum—has added thereto successive batches of fuming sulphuric acid, the mixture being agitated after the addition of each batch and then permitted to stratify into an oil layer and a sludge layer, the latter being drawn off before the next succeeding batch of acid is introduced. The first sludge produced by such treatment will usually contain a high percentage of acid coke and is therefore not so readily handled as are the later sludge dumps.

The sludge is first diluted with a medium heavy petroleum distillate, and after agitation and stratification the latter is drawn off, carrying with it a considerable proportion of the oil and oil-soluble or mahogany acids which were originally entrained in the sludge. The remaining sludge is now substantially free of the heretofore known mahogany acids.

Water is now added and the diluted sludge is thoroughly boiled and permitted to settle. The gravity of the separated acid layer should not be lower than 15 deg. Bé., the dilution being properly regulated to accomplish this result. By this treatment the bulk of the sulphuric acid present in the sludge is caused to stratify in the dilute solution at the base of the tank and may be drawn off.

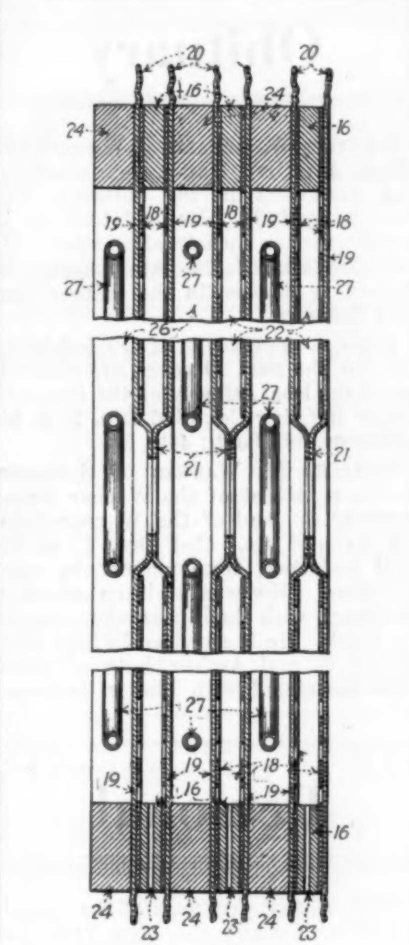


Fig. 1

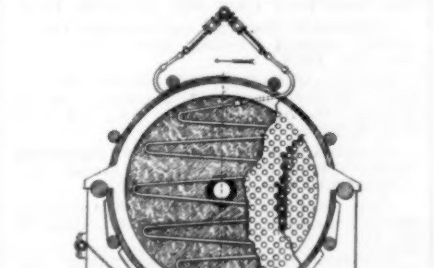


Fig. 2

The supernatant sludge layer is now treated with Na_2CO_3 in sufficient proportions to neutralize the sulphonic acids as well as any sulphuric acid present, producing sodium sulphonates and sodium sulphate.

The solution obtained thus is repeatedly extracted with naphtha for the removal of the remaining oil.

The oil-free sodium sulphonates and sodium sulphate are now treated with free sulphuric acid, and upon settling the mixture stratifies into an upper layer of the green sulphonic acid and a lower layer of sulphuric acid in which the green acids are substantially insoluble. The sulphuric acid being drawn off, the new sulphonic acids remain in a state of purity suitable for the market.

Book Reviews

Glue and Gelatine

CHEMISTRY AND TECHNOLOGY OF GELATIN AND GLUE. By *Robert H. Bogue, Ph.D.* 644 pages, illustrated. McGraw-Hill Book Co., New York. Price, $6.

The chemist who has had to go for the first time to the bookshelves in search of information on gelatine and glue has probably experienced a feeling of profound disappointment on finding, at most, a half dozen dingy, ancient-looking volumes weakly huddled together in an out-of-the-way corner, where the classics of chemistry trail off into carpenters' and painters' handbooks. The chemist's feeling of disappointment is likely to be intensified when he opens these time-stained volumes one by one and finds their contents about as antiquated as the cover; and he is in for quite a baffling time of it if he is really under the necessity of finding out how properly to test a glue, how to select the most suitable glue for a given purpose, or how best to use a glue in

Important Articles in Current Literature

More than fifty industrial, technical or scientific periodicals and trade papers are reviewed regularly by the staff of *Chem. & Met.* The articles listed below have been selected from these publications because they represent the most conspicuous themes in contemporary literature, and consequently should be of considerable interest to our readers. A brief résumé of each article is included in the reference given. Since it is frequently impossible to prepare a satisfactory abstract of an article, this list will enable our readers to keep abreast of current literature and direct their reading to advantage. The magazines reviewed have all been received within a fortnight of our publication date.

SPEED UP ENAMEL PRODUCTION WITH CONTINUOUS SPRAYER AND DRIER. Features of the enameling plant of the A. B. Stove Co., Battle Creek, Mich. *Ceramic Industry*, December, 1923, pp. 333-335.

TO PRODUCE 50 TONS OF CHINA DAILY. New principles introduced in the model plant of the Onondaga Pottery Co., Syracuse, N. Y., enable quantity production of high-quality ware. *Ceramic Industry*, December, 1923, pp. 336-341.

THE VALUE OF SALT BATHS IN HEAT TREATING. *Clifford B. Bellis.* A discussion of the effects of melting-point, thermal conductivity, viscosity, etc., on the utility of this type of liquid heating medium. *Forging-Stamping-Heat Treating*, November, 1923.

HEAT TRANSMISSION IN COOLERS, HEATERS AND CONDENSERS. *Basil Heastie.* A review of present knowledge of laws governing heat transfer, comparing work of contemporary investigators. *J. Soc. Chem. Ind.*, Nov. 23, 1923, pp. 443T-55T.

TREATING FABRICS WITH STRONG H_2SO_4 FOR PRODUCTION OF STIFF FINISHED COLLAR MATERIALS. *Raymond F. Bacon, C. H. Kidwell* and *P. H. Bascom.* A patent assigned to Van Heusen Products, Inc. (1,469,765), is described. *Color Trade Journal*, December, 1923, pp. 211-15.

MOLYBDENUM IN CAST STEEL AND IRON ROLLS. *W. Norman Bratton.* The effect of molybdenum as an alloy. The heat-treatment and wearing qualities of low-carbon alloy rolls. *Iron Age*, Dec. 6, 1923, pp. 1509-1510.

CZECHOSLOVAKIA'S GREAT STEEL WORKS. *Captain Godfrey L. Carden.* A description of the Witkowitz steel plant, where more than 25,000 men are employed. *Iron Age*, Dec. 6, 1923, pp. 1516-1520.

some particular industry. Manufacturing processes apparently are the principal thing to which these venerable treatises devote themselves, and yet the descriptions they give do not sound as if they would be very helpful to the chemical engineer who has a modern glue and gelatine factory to design or operate. But the worst feature of all is that no whole-hearted attempt is made in them to discuss glue and gelatine in their strictly chemical and colloidal aspects. For anything so academic as that the chemist has had to go to his magazines.

The field, therefore, was ripe for just such a book as Bogue has written, and he has thrust in the sickle with abundant effect. His outstanding accomplishment undoubtedly is the recapitulation of the epoch-making work that has been done on gelatine in the last quarter-century. Bogue is especially well fitted for such a task as this, and his book gives ample evidence of a familiarity with fields of science which one would scarcely expect to be productive of information on gelatine and glue. The theoretical aspects of the subject he handles with practiced ease. His book has the merit of being readable and fluent, and its value is enhanced by being liberally sprinkled with graphs, tables, cuts and other illustrative devices.

The latter half of the book addresses itself to a consideration of the technology of glue and gelatine, but one feels that this part of the subject is not treated quite as fully and authoritatively as the theoretical part. The author seems to be more at home with the hydrogen electrode and Van Slyke apparatus than with the glue pot and veneer press.

Certain classes of readers might wish the author had written certain sections of the text a little differently. Practical woodworkers, for instance, will wish he had inserted at least a chapter on vegetable glues, for vegetable glue to them is just as important as animal glue. Then, too, there are those, perhaps, who would like to see a somewhat different emphasis in the chapter on "The Conditions Affecting the Adhesive Strength of Glue." But these, after all, are merely minor criticisms, and the book as a whole is a scholarly, illuminating and suggestive work. Chemists have reason to be grateful to Dr. Bogue for furnishing such an up-to-date and comprehensive treatise on this difficult and neglected subject.

WILBUR L. JONES.

New Publications

NEW BUREAU OF MINES PUBLICATIONS: Bull. 208, The Electrothermic Metallurgy of Zinc, by B. M. O'Hara; Tech. Paper 312, Leaching Nonsulphide Copper Ores With Sulphur Dioxide, by Charles E. van Barneveld and Edmund S. Leaver.

THE CHEMICAL UTILIZATION OF WOOD IN WASHINGTON. By Henry Kreitzer Benson, professor of chemical engineering, Thomas Gordon Thompson, associate professor of chemistry, and George Samuel Wilson, associate professor of mechanical engineering, of the University of Washington, Engineering Experiment Station, Seattle, Wash.

Obituary

CHARLES W. BRYANT of Winchendon, Mass., a retired leather manufacturer and prominent in the industry, died Dec. 3, aged 77. He had been in ill health for a considerable time. He was the son of the late Charles B. Bryant, a pioneer in the leather tanning industry.

OTTO J. PETERSON of Philadelphia, Pa., for the past 29 years superintendent of the local refinery of the Franklin Sugar Refining Co., died Dec. 7, at his residence, 322 South 46th St.

CHARLES M. WARNER of Syracuse, N. Y., president of the Warner Sugar Refining Co. and of the Warner-Quinlan Asphalt Co., died Dec. 1, at his local residence, from pneumonia, aged 77 years. He was stricken about 6 weeks ago with the illness which caused his death. He is survived by two sons, Grover E. and Arthur, both of whom were associated with him in business.

Personal

E. D. BABST, president of the American Sugar Refining Co., New York, has sailed for Cuba and the West Indies, to spend the majority of his time in connection with company interests.

HARRY CARPENTER, formerly connected with the National Aniline & Chemical Co., has become president of the Harry Carpenter Manufacturing Co., 246 Water St., New York, recently organized.

W. V. CRUESS, of the University of California, is in Spain investigating the olive industry.

T. J. DONOGHUE has been elected president of the Texas Oil Co., New Orleans, La., and M. A. DYER has been elected secretary and treasurer.

ROBERT F. FERGUSON, of the Refractory Manufacturers' Association Research Laboratory at the Mellon Institute of Industrial Research, is making an extended study of operating problems in refractory plants throughout the country.

HERBERT A. GOLLMAR, until recently chief chemist of the Ironton By-Product Coke Co., Ironton, Ohio, is now with the research organization of the Koppers Co. plant in Jersey City, known as the Seaboard By-Product Coke Co.

Dr. KUNO B. HEBERLEIN of the International Process & Engineering Corporation, 42 Broadway, N. Y., has returned from a 4 months business trip in Europe.

Dr. HENRY LEFFMANN spoke before the Franklin Institute of the State of Pennsylvania, Dec. 13, on "Hydrogen-Ion Concentration in Relation to Animal and Plant Growth."

Dr. R. B. MOORE of the Dorr Co., formerly chief chemist of the Bureau of Mines, has been invited to take part in the celebration of the twenty-fifth anniversary of the discovery of radium, undertaken by the Fondation Curie in Paris, Dec. 26.

H. C. PARMELEE, editor of *Chem. & Met.*, spoke on Dec. 12 before the students of New York University on "English as an Engineering Tool."

F. W. PICKARD, vice-president of E. I. du Pont de Nemours & Co., Wilmington, Del., has sailed for Europe, and will visit the various agencies of the company while abroad.

D. WILLIAM SCAMMELL of Trenton, N. J., an official of the Lamberton Works of the Maddock Pottery Co., was elected president of the United States Potters' Association at the annual meeting, Washington, D. C., Dec. 6, succeeding George Mitchell of Coshocton, Ohio. CHARLES HOWELL COOK, president of the Cook Pottery Co., Trenton, N. J., was elected a member of the executive committee of the organization.

A. B. SEELIG, general manager of the Michigan Copper & Brass Co., Detroit, Mich., has been re-elected a director of the Copper & Brass Research Association.

Calendar

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE, seventy-fifth anniversary meeting, University of Cincinnati, Cincinnati, Ohio, Dec. 27 to Jan. 2.

AMERICAN CERAMIC SOCIETY, Atlantic City, N. J., Feb. 4 to 9, 1924.

AMERICAN CHEMICAL SOCIETY, regular meeting, Rumford Hall, Chemists' Club New York, Jan. 4, 1924.

AMERICAN INSTITUTE OF MECHANICAL ENGINEERS, New York City, Feb. 18 to 21, 1924.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS, annual meeting, New York City, Jan. 22 to 25, 1924.

AMERICAN SOCIETY OF SAFETY ENGINEERS, annual meeting, New York City, Jan. 18, 1924.

AMERICAN SOCIETY FOR STEEL TREATING, winter sectional meeting, Hotel Seneca, Rochester, N. Y., Jan. 31 and Feb. 1, 1924.

CANADIAN NATIONAL CLAY PRODUCTS ASSOCIATION, Prince George Hotel, Toronto, Ont., Feb. 13 and 14, 1924.

COAL MINING INSTITUTE OF AMERICA, annual meeting, Pittsburgh, Pa., Dec. 19 to 21.

COMMON BRICK MANUFACTURERS' ASSOCIATION, Biltmore Hotel, Los Angeles, Calif., Feb. 11 to 14, 1924.

ENGINEERING INSTITUTE OF CANADA, annual general meeting, Montreal, Jan. 22, and Ottawa, Jan. 23 and 24, 1924.

FEDERATED AMERICAN ENGINEERING SOCIETIES, annual meeting, Washington, D. C., Jan. 10 and 11, 1924.

FRANKLIN INSTITUTE, annual meeting, Philadelphia, Jan. 16, 1924.

NEW JERSEY CLAY WORKERS' ASSOCIATION AND EASTERN SECTION AMERICAN CERAMIC SOCIETY, annual meeting, New Brunswick, N. J., Dec. 19.

SOCIETY OF AUTOMOTIVE ENGINEERS, annual meeting, simultaneously with the Detroit Automobile Show, General Motors Bldg., Detroit, Mich., Jan. 22 to 25, 1924.

SOCIETY OF CHEMICAL INDUSTRY, Perkin medal award, Rumford Hall, Chemists' Club, New York, Jan. 11, 1924.

News of the Industry

Summary of the Week

Bureau of Chemistry announces progress in many fields of activity during year.

American Institute of Chemists outlines activities in membership classification, etc.

British chemical industries facing somewhat brighter prospects.

Shaw to direct research on the utility of silver.

Writ of mandamus issued against Tariff Commission in connection with application for change of duty for nitrite of soda.

Du Pont plants find safety work profitable in preserving both life and property.

Arsenic Committee issues interesting report on conditions in arsenic and calcium arsenate.

Muscle Shoals controversy directs attention to nitrogen needs of the country.

More specific information on production of dyes will be sought by Department of Commerce.

Bill introduced to prevent manufacture and sale of adulterated paint-making materials.

Suit Against Tariff Commission as Result of Hearing on Sodium Nitrite

Case Involves Constitutionality of Flexible Provisions of the Tariff Act; Right of Interested Parties to Examine Cost Data of Petitioners; Privilege of Cross-Examining Investigators Who Compiled Cost Figures

A SUIT was filed in the District of Columbia Supreme Court on Dec. 12, in the interests of the Norwegian Nitrogen Products Co. The suit seeks a writ of mandamus to compel the Tariff Commission to permit the petitioning company to have access to all information including data on production costs which the commission secured from the American Nitrogen Products Co. of Seattle, Wash., when the latter filed its application for an increase in duty from 3c. to 4½c. per lb. on importations of nitrite of soda.

Acting on this petition, Chief Justice McCoy issued an order directing the commission to appear on Jan. 4 and show cause why the petitioner should not be permitted to examine all the evidence as presented in the request of the American Nitrogen Products Co. for change in the present duty on nitrite of soda.

Is No Test of Act's Validity

This suit is not a direct action to attack the validity of the flexible features of the tariff act, but the application is so designed and worded as to invite a court decision which will definitely settle the constitutionality of delegating to an individual the power of taxing imports. This phase of the action makes the case of prime importance to importers and manufacturers in general.

Marion De Vries is acting as counsel for the Norwegian Nitrogen Products Co. He was associated with the Ways and Means Committee of the House and the Senate Finance Committee in drawing up the administrative provisions of the present tariff law and in designing the flexible provisions as now in force.

In addition to asking access for his client to all documents contained in the petition of the American Nitrogen Products Co., Mr. De Vries also asks the court to show cause why a public hearing should not be held by the Tariff Commission, at which interested parties might be given the opportunity of cross-examining investigators, agents, tariff experts and other witnesses who supplied information and data to the Tariff Commission in its investigation into the nitrite of sodium industry at home and abroad.

At the public hearings on nitrite of soda held by the Tariff Commission in September and October, Mr. De Vries, representing the Norwegian Nitrogen Products Co., opposed the petition for higher duty which was asked by the American Nitrogen Products Co. He was denied his request that the commission make public or available to his client the additional data gathered by representatives of the commission in their investigations. The evidence of the commission which had been introduced at the hearings showed production costs of nitrite in Norway to be much lower than those of domestic producers. The right of cross-examination also was refused. Mr. De Vries at these hearings and in the present writ of mandamus seeks to enforce the right of the Norwegian company to the issues denied at the hearing—namely, to examine the petition, with all its attendant evidence, of the American Nitrogen Products Co. and the privilege of cross-examining those who collected information for the commission.

Members of the Tariff Commission, after they had been served with the court order, referred the matter to the Department of Justice, which will conduct the legal proceedings on behalf of the government. In the meantime, it is stated, the new development will not bring about any change in the policy of the commission. This means that hearings already announced will be held.

Other Importers May Intervene

In view of the importance of the questions at issue it is expected that everything possible will be done to expedite matters and bring about an early session. Possibly many importing companies may enter into the case, as different firms are discussing the advisability of appearing before the court when the answer of the commission has been given, and will argue that Congress exceeded its authority in granting to the President the power to increase and lower duties. These importers take the stand that the flexible tariff is not constitutional, whereas counsel for the Norwegian Nitrogen Products Co. in his complaint expresses the opinion that the act is valid and he invites a decision on that point, though he does not make it a vital issue in his suit. Should other importers, however, intervene, it is certain that this constitutional question will become paramount.

Faith in American Chemical Industry Expressed at S.O.C.M.A. Meeting

Waters Made Honorary Member at Second Annual Meeting—Garvan, McMullen and Bancroft Speak—General Tone Is Optimistic

A SPIRIT of optimism with regard to the outlook for the industry prevailed at the second annual meeting of the Synthetic Organic Chemical Manufacturers Association, held at the Hotel Commodore, New York, on Dec. 14. About seventy-five members were present to hear addresses by Colonel J. I. McMullen, Dr. Wilder D. Bancroft, Dr. Charles H. Herty, president of the association, and other eminent leaders. Elon H. Hooker, president of the Manufacturing Chemists Association, unable to be present, sent a stirring letter which aroused much enthusiasm among the members. Daniel F. Waters, president of the Master Dyers' Association, who for many years has been a strong advocate of an independent American dye industry, was elected to honorary membership by a unanimous vote. Francis P. Garvan, also an honorary member of the association, was present and following the luncheon made an appeal for the preservation of an all-American dye industry. C. C. Concannon spoke on the work of the Chemical Division of the Bureau of Foreign and Domestic Commerce.

The deleterious effect of foreign patent control of essential processes was stressed by Colonel J. I. McMullen. He pointed out that our tariff and our patent laws, while good, were like other laws, not infallible. In the event that American research cannot produce processes ahead of foreigners, some expedient may become necessary in the way of modification of our existing code.

Dr. Wilder D. Bancroft, professor of chemistry at Cornell, addressed the meeting with regard to the fading characteristics of dyes. Without discussing American-made products especially, he pointed out that colors demonstrate individual properties when acted upon by light and that the phenomena of their behavior are but poorly understood. Data existing are not co-ordinated; nor are standard testing methods available, yet improvement of quality demands understanding of the laws underlying fading. Asserting that he believed a comparatively small amount of co-ordinated research along these lines should be productive of valuable results, Dr. Bancroft concluded his remarks by expressing his sincere wishes for continued success within the industry.

Mr. Waters, who incidentally is owner and proprietor of the Germantown Dye Works in Philadelphia, gave the chemical manufacturers an encouraging message as he responded to his election to honorary membership.

The German invasion of American chemical industry, hinted at by other speakers, was brought out in the open in stirring speech by Francis P. Garvan. He declared that "Dr. Bosch and all the little bosches," who have been in this country recently have so far failed in their efforts to form partnerships with American manufacturers. But the industry must be on guard, he declared, for the German cartel is getting ready to establish an active dye-manufacturing agency here.

"Significant incidents picked up at random in the day's work indicate that there is a suspicious trend toward a German infiltration in our chemical industry. I was present at a business meeting recently where it was definitely proposed that a 100 per cent American corporation should enter into direct partnership with a German bank in the exploitation of German processes in this country on the ground that we would make money for ourselves and for the Germans.

"It has been said that science has no national boundaries. Whatever may be the habits of science, it is at least a fair statement that common decency keeps close to the home fireside and does not deal with those who defy every law of business and international morality."
—*Elon H. Hooker.*

Would Fix the Status of Professional Chemists

American Institute Includes Other Plans in Program of Activities

"We must eventually provide a system of classification into which each chemist will fit and from which the faker and confidence man will be excluded. Our classification committee is at work upon such a scheme and will soon make a preliminary report. Meanwhile, it is gratifying to note that at the Milwaukee meeting of the American Chemical Society a committee was provided a part of whose duty is to deal with the same problem. It is expected that the two committees may work out a harmonious scheme that will provide for mutual and public recognition. Surely our profession cannot long tolerate the present chaos, wherein anyone may label himself 'Chemist' without let or hindrance." This statement authorized by the Council of the American Institute of Chemists, in connection with an outline of plans for the future, is indicative of the importance the organization places upon classification of the chemical profession. It is apparent that the Institute recognizes that its grades, Honorary Fellow, Fellow and Associate, and the apprentice group, Junior, are not sufficient as a means of classifying chemists. A better system must be worked out and in doing this the Institute stands ready to co-operate with the American Chemical Society.

Much of the Institute's statement has to do with organization and the plans for building up a membership that will represent both quality and quantity in the chemical world. It is stated that "naturally with increased membership, better plans and more effective means will come to our hands. But in building up quantity we must so control admission to the various grades of membership that not only our fellowship but the general world as well will recognize our 'hall-mark' as something of significance."

The report of the Institute's committee on ethics has already been given wide publicity and has generally been recognized as a brief but comprehensive ethical constitution, "in complete accord with the general ethical practice of other professional organizations." The Council believes that if the proposed report is adopted by the Institute, it will go a long way toward bringing about a much to be desired recognition of chemists.

The work of the legal committee of the Institute is of two sorts—first, to review and suggest modifications in the legal provision of civil service commissions and similar bodies which have a bearing upon the welfare of chemists; second, to keep a watchful eye upon proposed legislation and to take steps to promote favorable as well as to discourage inimical legislative propositions. In this connection the Council makes a plea for a conservative policy believing that "a large amount of investigation and careful scrutiny of proposals should precede any active steps."

Since at present there is no definition either of the quantity or quality of training required properly to prepare the chemist or the chemical engineer, the Institute is planning to provide a definition of the minimum quantitative requirement of collegiate training that is acceptable for membership. It is hoped that indirectly this will influence the work of those agencies that are at present engaged in arriving at a better recognition and understanding of chemical education.

While the Institute does not contemplate entering into the field of the labor union, it does propose to consider the economic aspects of the profession with a view of taking whatever steps the situation warrants. Already it has in operation a mutual employment agency which is endeavoring to aid its members in seeking employment. It is proposed that in the near future a comprehensive plan will be put before the membership for giving aid in such a way as to help the men to help themselves. It is not intended that this service shall involve payment of fees or of commissions.

This statement of views by the Council of the Institute is made at this time for the purpose of presenting a program, open to the suggestion and criticism of the membership as well as the chemical profession at large.

Washington News

Commerce Department to Expand Information on Dyes

More specific information with regard to dyes is to be collected by consuls and representatives abroad of the Department of Commerce. In this way it is hoped to ascertain the exact dyes that are used in the consuming centers of each country. The status of consuming processes is to be brought up to date. Information is to be furnished as to re-exports of dyes from the countries where distribution agencies operate in countries other than the one to which the shipments went in the first instance. More exact information is to be obtained as to dye production. There is very accurate information available as to production in the principal countries, but very little is known as to the industries in countries where dye making is relatively an unimportant industry. Much the same information is to be collected on medicinal and pharmaceutical products.

The department's recently issued Bulletin 165, dealing with the market for prepared medicinals in Brazil, has been the subject of such favorable comment that a similar report is to be called for from each foreign country. Later it is hoped to model a report on heavy chemicals along the lines of Bulletin 165.

The Chemical Division now practically has completed the gathering of the latest information on gums, rosin, flax and other raw materials used in the manufacture of paints and varnishes. A mass of material has been collected from all of the important producing centers, but the insufficiency of appropriations precludes the publication of any deductions which may be drawn from these reports. The material, however, is available to representatives of companies interested in such information.

Simplified Practice Division Has Had Active Year

The annual report of the Secretary of Commerce refers in part to the service rendered by the new Division of Simplified Practice established during the previous fiscal year. It states: "The total number of industrial groups now using this service of the department in developing definite steps toward simplification in their activities is 125, representing 90 different fields of production and distribution."

It further records that as a result of co-operation many different simplifications for saving of waste in manufacture and distribution have been consummated during the year. Among many instances, milk bottles were reduced from 59 sizes to 3 sizes; paving brick sizes from 77 to 6; the grades of asphalt from 88 to 9 varieties; sizes and varieties of hotel and institutional chinaware from 700 to 160; sizes and varieties of common brick and facebrick from a total of 73 to one recognized variety of each type.

"The annual value to industry and savings to the general public which such simplifications assure," says the report, "while difficult to estimate accurately, run in the aggregate into many millions of dollars, and their importance in the maintenance of our high standards of living need not be emphasized."

Shaw to Direct Silver Research

Research looking to the development of additional uses for silver has been begun by the Bureau of Mines. This decision was reached by the Secretary of the Interior after considering the recent preliminary report made by the bureau. In order that the work may start at once, he has transferred to the Bureau of Mines $4,000 from his reserve fund. He also has authorized a supplementary estimate calling for $15,000 for the continuance of the work during the next fiscal year.

L. I. Shaw, who has been serving the bureau for a number of years as assistant chief chemist, has been detached from the Division of Mineral Technology and transferred to the Division of Metallurgy, to take immediate charge of the work. His entire time will be devoted to the silver research. Other members of the technical staff will be assigned to this work when the necessary funds are available.

Dr. Shaw's first work will be to assemble the information already in the hands of the government. It is known that the Bureau of Standards has done important work in connection with the prevention of tarnish on silver. It is probable that the Bureau of Standards will participate in some phases of this research.

Muscle Shoals Question Draws Interest to Nitrogen Supply

Muscle Shoals is coming in for much informal discussion among the national legislators on Capitol Hill, Washington. There are wide differences of opinion as to what the government should do with the property, but it is significant that this whole discussion has aroused an interest in nitrogen that could not have been aroused to such an extent in any other way. The controversy over Muscle Shoals has had the effect of acquainting the nation with the importance of an independent supply of nitrogen and apparently has paved the way for whatever aid the Federal Government can extend in the advancement of research and encouragement in that connection.

Regardless of the disposition that may be made of Muscle Shoals, it is pointed out, the coincidence that a plant intended for the production of atmospheric nitrogen should have become involved in a political controversy is regarded as the most fortunate thing that could have happened to the movement looking to the encouragement of nitrogen manufacture. The mere fact that the project became involved in a spectacular political controversy, which was made even more spectacular by the entry of Henry Ford, has resulted in a vast amount of public education, it is pointed out, and what is more, it has developed a decided public opinion that we should be less dependent upon Chile for our supplies of nitrogen.

In this connection, however, it is interesting to note that during the first 6 months of the current year imports of nitrogen in various form from Germany are 30 per cent greater than shipments from that source during the entire year of 1922.

Adulterated Paint Materials Subject to Senate Bill

Steps to prevent the manufacture, sale or transportation of adulterated, mislabeled or misbranded linseed oil, turpentine or paint are prescribed in a bill introduced in the Senate by Mr. Ladd of North Dakota. The penalty clause of the bill calls for a year's imprisonment and a fine not to exceed $500 for the first offense. The limit of the fine is increased to $1,000, to be applied for each subsequent offense. The Department of Agriculture is required to establish standards for linseed oil.

Waggaman Leaves Soils Bureau

It has just been announced that W. H. Waggaman has resigned as chemist of the Bureau of Soils to accept a position with the Victor Chemical Co., Chicago. Dr. Waggaman will continue work on phosphates and phosphorous chemicals, which are among the important products of this company. Dr. Waggaman's work on phosphate rock, which has formed the basis of an important series of articles published recently in *Chem. & Met.*, will be continued by the bureau.

Legislation Asked Against Oil Pollution of Water

Bills have been introduced in each house of Congress providing that it is to be unlawful to pollute any of the navigable waters of the United States with oil or other refuse other than sewage from streets, sewers or vessels. Violations are made punishable by fine not exceeding $1,500 nor less than $500, or by imprisonment for not less than 30 days nor more than 1 year.

Customs Form Amended

Announcement has been made by the Treasury Department to the effect that customs form 7581, "bond to produce bill of lading," has been amended and reprinted to conform with the law and regulations under Section 484, Paragraph C (2) of the tariff act of 1922 and T. D. 39,400.

Consumption of Calcium Arsenate Doubled Last Season

With Favorable Prices May Again Double in Coming Season—Report of Arsenic Committee Gives Statistics of the Trade

At a general meeting of the arsenic trade held in New York Dec. 7, the Standing Committee on Arsenic, of which Dr. B. R. Coad is chairman, issued a comprehensive report on conditions affecting arsenic and calcium arsenate.

Touching on production and consumption of calcium arsenate last season, the report states that Dr. Coad received direct reports of sales from fifteen of the seventeen domestic producers of calcium arsenate and has rather close approximations to the sales of the two others. These reports have been checked and proved essentially correct. He also obtained data on stocks held by manufacturers, jobbers and ultimate consumers. These figures refer to the "cotton year," Sept. 1, 1922, to Sept. 1, 1923, and are as follows:

Sales of calcium arsenate, made from domestic and imported white arsenic and including a small quantity of carried over stocks, about 34,000,000 lb.; total stocks at end of year, about 3,000,000 lb.; actual consumption, about 31,000,000 lb.

The stocks left at the end of the year were due in part to sales for proprietary mixtures which failed to materialize. They were largely in Georgia and South Carolina. The stocks left in Mississippi and states to the west were negligible.

The proportion of cotton treated has also been determined from reports by 4,700 farmers who poisoned their cotton, mostly by dusting, but in part by liquid preparations. The average quantity of calcium arsenate used per acre was 18.5 lb., and the acreage treated was 1,674,000 out of a total of 38,287,000 acres in cotton, or 4.4 per cent.

Estimated Demand in 1924

With these figures as a starting point, an estimate of the requirements for the 1924 season has been made and has involved all conceivable factors. Reports have been received from county agents and checked by others having oversight over groups of counties; the views of users regarding the coming season have been received, as have the views of about 20,000 growers who heretofore have not used calcium arsenate, and the views of distributors. All such factors have been weighted and due consideration has been given to possible changes in the mental attitude of growers. The resulting estimate can be only a rather rough approximation, especially as the cotton growers have strong convictions as to ideal and prohibitive prices.

They feel that 10c. a pound is the ideal price for calcium arsenate. This figure is evidently due largely to the widely published accounts of a contract recently made by the State of Georgia to purchase large quantities at that price. Higher prices would rapidly decrease demand, and 17c. a pound (f.o.b. factory) is the limit beyond which practically no sales would be made for boll weevil control. As a base price of 10c. a pound for calcium arsenate is out of the question, since the domestic and imported arsenic from which it is made have been selling for prices little if any below that figure, it is useless to forecast a demand based on such a price. Were it possible for manufacturers to sell calcium arsenate profitably at 11.5 to 13.5c. a pound (f.o.b. factory), the demand would be from 65,000,000 to 75,000,000 lb.; were the price to be 16c., the demand would drop to 35,000,000 or 40,000,000 lb. There is danger that this wide range of figures will give different parties an opportunity to remember only those figures that sound the sweetest; but there is no occasion for sensible men to fool themselves. The estimate shows that under reasonably favorable conditions, including a minimum spread in price and a considerable amount of early buying, the demand for calcium arsenate may again double, as it did last year. Will the supply be equal to this increase in demand?

Production and Imports of White Arsenic

According to figures compiled by the United States Geological Survey, sales of white arsenic during the first half of 1923 amounted to about 6,000 short tons. There has been some increase in capacity for production during the last half of the year, and it will not be surprising if the production for the year is as much as 15,000 short tons. More definite figures will be available shortly. If this implied production of 9,000 tons in the last half of 1923 is continued through the first half of 1924, a total domestic supply of 18,000 tons will result.

General imports of white arsenic during the first 10 months of 1923 amounted to 8,384 short tons, a rate of about 10,000 short tons a year. Imports for consumption during the first half of 1923 amounted to 5,674 short tons, a little more than half the suggested rate for the year. If this rate continues until July 1, 1924, imports available for the "cotton year" will be about 10,000 tons, which added to domestic production gives a total possible supply of 28,000 tons of white arsenic, whereas the requirements based on 11.5 to 13.5c. a pound for calcium arsenate call for about 15,000 tons, and minimum requirements for other arsenic compounds call for about 10,000 tons more. The possible supply for the coming season, therefore, is equal to the possible demand. There are indications that imports are declining at present, and that foreign supplies are low; but if imports arrive too slowly, a sufficient inducement would doubtless stimulate domestic production accordingly. In other words, the coming season also will work out according to supply and demand; but what are the reserves for future years?

New Sources of Supply

In connection with the development of new sources of supply for arsenic the committee recommended that Congress authorize and appropriate funds for making geological surveys.

The committee has also recommended, supplementary to each survey, as complete a compilation as possible of data on foreign reserves. Some data have already been compiled, and more will be gathered as rapidly as possible. A foreign field study by the Geological Survey is impracticable, but first-hand field data are much needed.

No definite policy regarding a change in duty for calcium arsenate was adopted by the committee. Some members recommended no opposition to removal; another that, if the tariff is removed, adequate precautions be taken to prevent the dumping of inferior material in this country. It was also pointed out that imports of calcium arsenate have been very few and are not likely to attain great proportions very quickly. Inquiry by the Geological Survey of the Port Collectors of the Customs Service succeeded in disclosing only one shipment, about 33,000 lb., received at New Orleans. This is 0.1 per cent of the consumption in 1922.

Would Color Gasoline Red!

Gasoline is often mistaken for water, kerosene, or some other colorless liquid, and apparently this mistake often results in explosions and fires, and sometimes in loss of life.

The novel suggestion that all motor gasoline be colored red as a safety measure designed to guard against its being mistaken for water, kerosene or other colorless liquid products is advanced by W. A. Jacobs, chemical engineer, Department of the Interior, who has been detailed by the Bureau of Mines to make a special study of the hazards of gasoline.

In war time the army and navy require that all gasoline of the so-called "fighting grade" be colored red. This is a safety precaution which indicates to the men handling the fuel that it is much more volatile than the ordinary motor gasoline and consequently more likely to take fire and possibly produce a violent explosion. The red color also serves to prevent the filling of the fighting planes with motor gas, which is not sufficiently volatile and is likely to cause the motor to fail and result in a bad accident.

Information is at hand that certain shipments were condemned for not meeting the requirements of the Board of Insecticides and Fungicides. From what little is known of foreign manufacture of calcium arsenate, the quantity produced is apparently little, if any, in excess of foreign requirements, and increased production to supply the United States with the proper grade of material will not develop very rapidly.

Discussion on the Report

In the general discussion, which was one of the features of the meeting, H. M. Brush, of the American Smelting & Refining Co., said that the bulk of the production could be accounted for through direct production from ore. However, in the event of any slump in the demand for arsenic, direct production could not compete on a price basis with the byproduct. Mr. Brush believes that the possibility of discovering some substitute for killing the boll weevil should not be overlooked and because of this uncertainty new producers must take advantage of the market. F. Robertson, of the United States Smelting & Refining Co., blamed dealers and manufacturers for advances in prices, the question of consuming demand and available supply receiving scant consideration.

Alexander Goulard, of John Lucas & Co., Inc., questioned the action of Georgia officials for entering into the problem of marketing calcium arsenate. Ira Williams, entomologist for the State of Georgia, refused to discuss the much disputed Georgia contract, but said that it was still in force. He said that it was his business to see that the farmers of his state obtained calcium arsenate at a fair price and, in time, expected to see a law on the statute books of his state compelling cotton growers to use calcium arsenate.

Dr. Coad spoke at length on the price spread between producer and consumer. He explained the sudden demand for arsenate toward the end of the last crop year, attributing the late buying to ravages of the leaf worm and not the boll weevil. The manufacturers' sales prices for the bulk of last season's production ranged from 10½ to 12c. per lb. The farmer paid about 90 per cent advance over the manufacturers' selling basis. The reduction of this spread Dr. Coad regarded as a problem of great importance to the manufacturer.

Felix Morgenstern laid most of the ills of the industry, especially the marketing end, to the Georgia contract. In reply Ira Williams said that the Georgia Board of Entomology has experienced great difficulty in dealing with manufacturers, notwithstanding the fact that the state is in a position to make prompt payment and accept goods whenever ready for delivery or regardless of the season of the year. It was not the plan of the state, he said, to enter into the arsenate business, but should manufacturers insist on the policy of no direct dealings, the state might be forced to erect a plant of its own and operate it for its citizens.

News in Brief

It is claimed by the agricultural experiment station of Oregon that much of the sagebrush and greasewood land in the state could be brought under cultivation by irrigation and drainage for removal of alkali by flooding with open ditches 10 ft. deep, followed by treatment with sulphur, gypsum or ammonium sulphate.

Natural gas is now being delivered in Edmonton from the Viking field, where ten wells are in operation with a daily open flow of 40,000,000 cu.ft. Seventy-seven miles of main lines was constructed between Edmonton and Viking, and 81 miles within the city. The total cost of the undertaking was about $3,000,000.

Rubber mills about Akron, Ohio, are increasing production and adding to the working forces. Combined manufacture is now on a basis of 70,000 to 75,000 tires per day, as compared with an output of 110,000 tires daily during the summer months. The different mills are arranging schedules for a gross production of approximately 45,000,000 tires during the coming year.

A fisheries experimental station to cost in the neighborhood of $70,000 is to be established in Halifax, N. S., by the Canadian Government. Among other things, it will serve as a model fish-drying plant for testing and demonstrating the effect of salt and temperature on dried fish, and will be used for demonstrations and instruction in the best methods of curing.

Under the auspices of the Roswell Park Publication Fund of the University of Buffalo, a monograph on "The Niagara River and Power Plants on the American Side," by E. Raymond Riegel, associate professor of chemistry of the university, has been published. This is an exhaustive scientific treatise on the subject.

Progress and bright prospects in the development of sodium sulphate in Saskatchewan are reported by the provincial Bureau of Labor and Industries. Sodium sulphate recovered from Saskatchewan deposits is now being used in the manufacture of glass at Redcliff and six deposits so far have been investigated by the Federal Department of Mines. Other known deposits not yet investigated number close to ninety.

The government will manufacture its own print paper if Congress passes and the President approves H. R. 114, which is a bill introduced by Congressman J. E. Raker of California "authorizing and directing the Public Printer to provide a pulp and paper mill or mills for the manufacture of print paper for the government and for other purposes."

The Luzerne Coal & Coke Co., Pittsburgh, Pa., has acquired the Orient plant of the American Coke Corporation, near Uniontown, Pa., at a public sale, for a consideration of $895,000, and plans to operate the property in connection with its other works in this section.

An appropriation of $100,000 is proposed in a bill introduced by Senator McKellar of Tennessee to enable the Secretary of Agriculture to carry out investigations of the causes and means of preventing fires and dust explosions in industrial plants.

Incorporation has been granted by the Province of Quebec to the Steele Tremblay Paper Co., Ltd., which is capitalized at $10,000,000. The incorporators are James J. Steele, pulp manufacturer and engineer of Montreal; Adelard Tremblay, contractor of Metabetchouan, Quebec, and George W. McFarland of Brampton, Ontario.

Madagascar Develops Wax Trade

Considerable activity has taken place recently in the gathering and exportation of a product called "lokombitsika," a kind of gum or wax produced principally in the Province of Fort Dauphin, in the southern part of Madagascar, according to a report from Consul James G. Carter, Tananarive. This material is said to be formed on the branches of trees in the forests by an ant insect known as the *Gascardia madagascariensis*. Its exportation has been confined recently to France, where it is employed in connection with the manufacture of varnish and possibly for other purposes. It is sometimes sold as gum lac. Previous to the war sample lots of this wax were sent to Germany by the German firms then doing business in Madagascar.

French Figures on Polish Industry

The French Bureau of Statistics has just published the following with reference to the chemical industry of Poland, as ending Jan. 1, 1923. There were 120 plants in active operation, employing 15,875 workers. Production was as follows:

	Metric Tons
Ammoniacal soda	70,000
Caustic soda	9,200
Sulphuric acid	50,000
Superphosphates	60,000
Chlorate of potassium	500
Dyestuffs	1,800
Methanol and turpentine	350
Bone dust	6,000
Animal glue	2,000
Animal fats	400

French Seek English Film Trade

To counteract American competition Pathé Frères are about to erect a plant in England for the production in that country of cinematographic films and emulsions. The French company, benefiting from 7 years experience in the production of band films in its Vincennes plant, has made elaborate plans for this new English plant. The president of the administration council of Pathé Frères has stated frankly that the decision to enter the lists in England was arrived at by consideration of the fact that the Eastman company had already proceeded in a similar manner. Continuing, he said "it was either a case of doing likewise or abandoning the British market to their competitors."

To Further Helium Activities

The Secretaries of War, Navy and the Interior have agreed upon the provision of the new helium bill, which has been introduced by Representative Kahn, chairman of the Committee on Military Affairs of the House. The measure authorizes the Secretary of the Interior to purchase gas and acquire extraction rights in gases and to lease or purchase lands for the purpose of producing or conserving helium. To carry out the purposes of the bill, an appropriation of $5,000,000 is provided.

The measure carries with it authority to conduct exploration operations and to store helium gas once that it is produced. All existing government helium-producing plants are to be transferred to the jurisdiction of the Secretary of the Interior. Full authorization is given for the conduct and encouragement of experimental work. The bill embodies a stringent prohibition against any export of the gas.

Ford's Glass Plant Goes Into Production

The Ford Motor Co. has commenced operations at the new glass-manufacturing plant at its River Rouge, Detroit, Mich., works, in course of construction for some months past, designed as the largest producing unit of the company. Two furnaces are operating and the other two will be lighted shortly after the turn of the year. The plant will have a rated capacity of 10,000,000 sq.ft. of glass per annum. At its works at Glassmere, Pa., the company is now running on a basis of 7,000,000 sq.ft. per year maximum rated output, while the smaller plant at Highland Park, Detroit, the initial experimental plant, has a capacity of about 3,400,000 sq.ft. annually. The total company requirements are said now to aggregate 20,500,000 sq.ft. of glass a year.

Sweden Finds Shale Oil Tests Promising

Experiments in the manufacture of crude oil from Swedish shale at the Kinnekulle works are said to have given very satisfactory results and technically the problem is considered as solved. It is also asserted that the cost of production only amounts to 50 kr. per ton and it is calculated that the gases obtained as byproducts can be utilized, thus reducing the production costs of the oil to about 30 kr. The cost of the construction of a mill working up 50 tons of shale daily is estimated at 75,000 kr. The future importance of this new source of oil production cannot, however, be exactly determined before the quality of the oil has been thoroughly examined.

Bureau of Chemistry Reports Progress in Many Activities

Naval Stores, Food Products, Insecticides and Material Utility Studies Constitute Major Part of Year's Work

THE work of the Bureau of Chemistry during the past year covered a wide variety of subjects, according to the annual report of the bureau to the Secretary of Agriculture. Important researches have been carried on relative to the chemical composition of various crops, especially with relation to quality production; the odorous principles of the cotton plant were studied in an effort to help solve the boll weevil problem; extensive studies of plant proteins are being made, and of vegetable oils. Methods are being devised for the profitable utilization of cull and surplus oranges and lemons.

The report tells briefly of work that has been done in tanning leather and in making articles of leather more resistant to wear and weathering. Valuable information was collected on waterproofing, mildewproofing, and fireproofing of fabric such as canvas used extensively on the farm.

Better means for utilizing cull and surplus sweet potatoes are being studied which should be important to great areas in the South where this crop grows well. Other work of benefit to this same section has to do with the manufacture of cane sirup and sugar. Work also was done on sorgo sirup and beet sugar. Many of these new facts promise to be of great value in increasing profits and in opening up the way for other improvements.

Many Subjects Covered

The investigations of this bureau, although they are related to agriculture directly or indirectly, reach into fields that touch manufacture of many products other than food or clothing. Studies have been made of insecticides, and a great deal of work has been done on investigations of causes of dust explosions that occur in a wide variety of industries, in threshing machines, in cotton gins and in elevators. Information is being collected on the dehydration of fruits and vegetables, including cull oranges, cherries, rhubarb, cauliflower and onions.

Better methods are being devised for the manufacture and grading of rosin and turpentine and demonstrations are being carried on among the producers. Another branch of the work has to do with color, medicinal and technical investigations. More information has been obtained on uses for furfural and other chemical products which the bureau has found can be made from corncobs. Cheaper processes have been devised for manufacturing certain of these products.

In addition to the food and drugs act, the bureau enforces the tea inspection act and the naval stores act, laws designed to protect the public from being defrauded and to provide certain standards for these products. During the year nearly 100,000,000 lb. of tea was examined for quality and purity at the ports of entry. The naval stores act is a new law and so far no funds have been provided for its enforcement. During the year there were 621 prosecutions and 829 seizures under the food and drugs act, and the quality of foods and general conditions in the trade have greatly improved under the operation of this law.

Du Pont Plants Find Safety Work Profitable

At a convention of the safety division of E. I. du Pont de Nemours & Co., Wilmington, Del., covering all plants, held at Hotel du Pont, Wilmington, Dec. 3, it was shown that since the inception of organized safety work by the company there has been an estimated saving in all branches of 893 lives, as well as more than $1,000,000 in cash outlay. Safety work at the explosives plants was commenced 11 years ago, and based on a continuance of the fatality rate then prevailing, the theoretical saving in this period has been 864 lives. Taking all divisions of the company as a unit, there are now one-sixth of the accidental deaths that existed prior to 1911. Significant reduction in accidents has been accomplished in the other lines in which the company is operating. The estimated prevention of non-fatal injuries totals 8,195, with estimated savings which would have been due under compensation for such class of injuries of $652,060. Lewis A. DeBlois is manager of the safety division of the organization.

Mechanical Engineers Support Reforestation

The Forest Products Division of the American Society of Mechanical Engineers, the largest single organization of professional engineers in the country, will urge the adoption by Congress and by the legislatures of the various states of a "definite constructive program for maintaining the productivity of our forests and forest lands under government auspices and at public expense."

The division, according to an announcement made by Chairman Thomas D. Perry of Grand Rapids, Mich., at the society's national headquarters in New York City, will recommend that this society place its resources at the command of the Federated American Engineering Societies in arousing the interest of the nation's engineers in timber conservation and reforestation "as absolutely necessary to continue our timber supply and to perpetuate our water power and inland navigation."

Britain's Chemical Industries Facing Brighter Business Conditions

Coal and Iron Outputs Show Increase in Year—Ammonium Sulphate Moving Faster—Dyestuffs Exports Increase

THERE has been a small but welcome improvement in some of the fundamental industries of Britain in the recent past. Coal production is markedly better than it was a year ago, and there has been a welcome increase in the output of pig iron; the monthly average this year has been 621,030 long tons, compared with 408,500 tons in 1922, 218,000 in 1921, and 669,500 in 1920, while the output for October, 1923, is 23 per cent greater than in October, 1922.

The British Sulphate of Ammonia Federation, which represents 90 per cent of the home production, also reports better business. Whereas the price of ammonium sulphate fell 41 per cent from 1920-21 to 1921-22, it rose 10 per cent during the past financial year; at the same time production increased about 50 per cent, home deliveries 3 per cent and exports no less than 58 per cent, the increased sales being ascribed by the federation to better propaganda and to improvement in quality, the acid-free material now constituting about 70 per cent of the total output. Among the producers that have recently joined the federation are Synthetic Ammonia & Nitrates, Ltd., the offspring of Brunner Mond & Co. at Billingham-on-Tees, and a large proportion of Canadian manufacturers of ammonium sulphate. The high cost of sulphuric acid is still an adverse factor, the price being 60s. per ton, as compared with 25s. per ton before the war; it is, however, satisfactory to note that the federation is actively negotiating with National Sulphuric Acid Association with the object of bringing about a price reduction.

Dyestuffs Shipments Increase

Recent statistics show that the British export trade in dyestuffs has much improved, for which the present plight of Germany is doubtless mainly responsible. From these and other indications it would appear that, given peace at home and more stable political conditions on the Continent, the long-delayed general revival in trade is not far off.

It is announced by S. Davis & Co. of London that an export edition of "'Where to Buy' Everything Chemical" will be published in the new year. It is to be printed in five languages and is a classified compilation embodying the principal sources of supply of most chemicals and chemical plant, with a guaranteed circulation of 10,000 copies among buyers of chemicals in all parts of the world.

Produce Foundry Iron by New Methods

Experimental work on the production of foundry iron from sponge iron in the electric furnace, performed by the Department of the Interior at the Seattle station of the Bureau of Mines, has demonstrated that technically, at least, the process is a success, though large-scale tests are necessary to determine its commercial applicability. Such a process would find application in melting iron in regions remote from blast furnaces, or where establishment of blast furnaces would be impracticable. Sponge iron was melted in batch runs and continuous runs, in various types of furnaces, and under both acid and basic conditions.

The type of furnace found best fitted for the continuous melting of sponge iron is a deep pit furnace with a single electrode and a conducting hearth. The main problems solved were: High recovery of iron, clean separation of the slag, obtaining metal of a high-carbon content, introduction to the metal of silicon and manganese from the slag to eliminate the necessity of using ferro-alloys, and, finally, the removal of sulphur. In order to produce the best quality of gray iron, an auxiliary furnace would be necessary to adjust the final composition of the metal.

The feasibility of producing a good grade of foundry iron from steel scrap in the electric furnace has also been demonstrated in experimental work performed by the Department of the Interior at the same experiment station. This development permits any manufacturing plant to use all its iron scrap on the spot in making castings equal to if not better than those from cupola iron. Improved methods of charging the 300-lb. experimental furnace used by the Bureau of Mines gave more rapid carburization, and carbon contents as high as 5 per cent were reached. Several heats were made in a 1-ton commercial electric furnace of the Heroult type, at Hoquiam, Wash., and in a 1-ton indirect-arc, rocking furnace in a foundry at Detroit, Mich. In every case these tests were successful in producing sound, strong gray iron from steel scrap and iron turnings.

Claude Proposes New Fertilizer

As a result of the recent congress of industrial chemistry held at Paris at the Conservatory of Arts and Trades Georges Claude has demonstrated the remarkable progress achieved in searching for a new fertilizer which would combine elements of nitrogen and potassium, of which the price must be less than that which is commonly used.

He has utilized for its production a combination of synthetic ammonia with sylvanite from the Alsatian potash mines and has succeeded in producing at a very low cost a "potassium-ammonium chloride" fertilizer product which is immediately soluble. For the third element so necessary for the growing of cereals, phosphorus, M. Claude expects to be able to incorporate it herein by the employment of a substitute for superphosphate. The latter material is of necessity costly because of the sulphuric acid required for its manufacture. This substitute is a simple natural phosphate from rock reduced to an impalpable powder by the application of the Cottrell electric process.

Ontario Industry Thriving

In the mineral fields and pulpwood areas of northern Ontario industry is growing at an unprecedented rate. Thousands of men are enjoying profitable employment and tens of millions of dollars in new wealth are being produced from the natural resources of the district. This wide industrial expansion is due to the activities of such concerns as Hollinger Gold Mines, International Nickel Co., Spanish River Pulp & Paper Mills and the Abitibi Power & Paper Co., the last mentioned being the largest pulp and paper mill under one roof in the world. These four companies have a combined output of approximately $60,000,000 annually. The demand for nickel and copper holds out reason for believing the output of the International Nickel Co. will increase to about $20,000,000 in the not far distant future.

Trade Notes

A new 4-story building will be built for Berry Bros., Inc., at Detroit. The new building, when completed, will be used for the production of white enamels.

The steamship "Hague Maru" arrived at San Francisco Dec. 10 from the Far East with 106 bbl. of china wood oil and 340 cases of arsenic.

Exports of artificial silk from the Netherlands increased from 516 metric tons in the first 9 months of last year to 1,191 metric tons for the same period of 1923, of which 371 metric tons was shipped to the United States.

At the December meeting of the Chemical Club of Philadelphia the discussion indicated that there would be a general closing of offices of chemical companies in that city on Dec. 24. The following were proposed for membership: The Mathieson Alkali Works; Henry Bower Chemical Mfg. Co.; William H. Bray Mfg. Co.; Joseph W. Leberman, Jr.; John T. Lewis & Bro.; Sherwin-Williams Co.

In an opinion sustaining a protest of Leslie Mott, Inc., of New York, the General Appraisers find that imported motifs, composed of galalith, should have been taxed at the rate of 40c. per pound and 25 per cent ad valorem, under paragraph 33, rather than at the rate of 90 per cent ad valorem under paragraph 1430, tariff act of 1922.

Market Conditions

Consumers of Chemicals Place Numerous Orders for January Delivery

Spot Trading Is Quiet—Prices Hold Steady Tone Throughout the Week—Basic Chemicals Move Steadily Against Contracts

VARIOUS consuming industries were reported to be buying chemicals for January delivery. A good part of this business was direct between producer and consumer with the result that dealers were not active. The spot market was quiet with only small lot trading noted and most buyers covered for the remainder of the month. The fact that plant operations in the latter part of the month are expected to be curtailed also has an effect on current trading.

For the most part, prices have maintained a steadier tone and holders of stocks have not been pressing sales to the same extent as formerly noted. The weighted index number for the week was a little higher than in the preceding week but this was almost entirely due to the firmer position of some important allied materials.

The recent meeting of members of the arsenic trade and the report of the Arsenic Committee have served to disseminate information on the arsenic situation. As a result of this information it is generally held that speculative trading will be lessened as prices are not expected to go higher and possible supplies are indicated to be large enough to take care of possible demand without causing any squeeze in the market. In fact it is pointed out that demand for calcium arsenate will move in direct ratio to price fluctuations in arsenic with high prices for the latter automatically cutting down consumption of the arsenate. Interest in arsenic was sustained throughout the week but actual trading was slower.

One of the important developments of the week was found in the action brought against the Tariff Commission in connection with the attempt to secure a change in the duty on nitrite of soda under the flexible provisions of the tariff act. While this is of direct interest to members of the nitrite trade it has a wider significance inasmuch as the suit may involve the question of the constitutionality of the flexible tariff. An official ruling on the latter question will act as a precedent in the cases of other chemicals on which application for tariff changes have been made.

Latest official figures, those for October, prove that imports and exports of chemicals are running heavier than for the corresponding periods of last year. Returns at the local port would indicate a continuance of arrivals of chemicals abroad but it is possible that exports this month may show a decline.

Domestic Tartaric Acid Reduced — Citric Acid Also Lower — Arsenic Easier on Spot — Tin Salts Firm — Bichromates Steadier — Liquid Chlorine Easy — Prussiates Unchanged—Soda Ash Moving Freely — Caustic Potash Quiet but Steady

Acids

Acetic Acid—Further evidence of the slump in export buying is found in the government returns for October which show that only 39,969 lb. were exported in that month as compared with 323,442 lb. in October last year. For the 10 months endeed October exports were 690,860 lb. in 1923 and 4,931,642 lb. in 1922. Demand for home consumption is quiet but large consumers are taking normal amounts against contracts. Prices are unchanged at: $3.38@$3.63 per 100 lb. for 28 per cent; $6.78@$7.13 per 100 lb. for 56 per cent; $9.58@$9.83 per 100 lb. for 80 per cent; $12@$12.78 per 100 lb. for glacial.

Boric Acid—Export trade in this acid also has been slower. In October outward shipments were 69,881 lb. as against 120,983 lb. For the 10 months exports were 792,594 lb. this year and 1,383,227 lb. in 1922. There were no new features in the market last week. Routine buying is reported with prices at 9½@10c. per lb. for powdered or crystals, in bags; 10@10½c. per lb. in bbl.; and 10½@11c. per lb. in kegs.

Citric Acid—The easy position which the market has held in recent weeks finally resulted in a decline in the open quotations for domestic acid. The new schedule quotes crystals at 48c. per lb. and the powdered at 49c. per lb. Imported grades are easy with the asking price at 48c. per lb. but sales have been made at 47c. per lb. Imports in October were 83,075 lb. and 65,666 lb. in October last year. For the 10 months ended October imports were 775,112 lb. this year with figures not separately compiled prior to October last year.

Oxalic Acid—Sellers are still willing to shade prices in large lots but on small lots they are asking up to 12½c. per lb. On round lots 12c. per lb. is quoted but 11¾c. per lb. might be done. These prices apply both to spot goods and to shipments from works. There is very little difference in price between imported and domestic grades as the foreign makes are held at 12c. per lb. spot and 11¾c. per lb. on shipments. Imports in October were under those of a year ago, the figures being 186,809 lb. and 324,319 lb. respectively. For the 10 months imports were 2.258.594 lb.

Tartaric Acid—Another decline of 1c. per lb. for domestic acid was announced early last week. This places the quotation at 30c. per lb. for powdered and crystals. Imported was easy at 28c. per lb. with reports that 27½c. per lb. could have been done. There is not much interest on the part of consumers and no large transactions were reported. The importance of imported grades on our market is shown by the fact that during October arrivals from abroad were 485,493 lb. as compared with 347,586 lb. in October last year. Imports for the year through October were 1,998,137 lb.

Potashes

Bichromate of Potash—There is not much life to present trading and quiet conditions are expected to rule until after the turn of the year. Contract deliveries account for the greater part of the movement from producing points. Jobbing trade is slow. Prices were reported to be steady at 9½c. per lb. for round lots. Considerable interest is reported for chrome ore for next year delivery. British trade in bichromate shows a gain this year as exports for the 10 months were 3,367,616 lb. as compared with 1,994,832 lb. in 1922.

Carbonate of Potash — Imports of carbonate of potash in October reached a total of 449.026 lb. as compared with 381,583 lb. in October last year. For the 10 months ended October imports were 8,741.761 lb. Moderate buying is reported in the local market. Calcined 80-85 per cent was offered at 5¾@6c. per lb. and 96-98 per cent at 6¼@6½c. per lb. Hydrated 80-85 per cent was quiet at 6c. per lb.

Caustic Potash—Although recent importations have been of good volume, a large part of arrivals is said to have been sold ahead and they have had no effect on market values. Both spot and shipments from abroad are quoted at

6⅜c. per lb. Imports have been large this year, reaching a total of 8,075,553 lb. for the 10 months ended October. October arrivals were 670,146 lb. as compared with 1,062,973 lb. in October 1922.

Permanganate of Potash—There was no improvement in this market. Spot offerings of imported makes were quiet with holders willing to sell at 15½c. per lb. Domestic permanganate also was quiet with 17c. per lb. asked at works. Future positions of imported continue to command a premium over spot offerings and 16@16½c. per lb.

Prussiate of Potash — A slightly firmer tone was in evidence and the majority of sellers were asking 24c. per lb. There was no improvement in buying and the market is in a position where prices may be influenced according as buying or selling pressure predominates. Shipments are still under the spot market and as low as 21c. per lb. has been named on forward positions with 22@22½c. generally asked.

Sodas

Bichromate of Soda — Prices for bichromate are largely a matter of quantity. Producers have definite quotations for specified quantities and the low prices which have been quoted have not been open to all buyers. On very large lots sellers compete keenly although certain first hands have not met the lowest prices which have been named. It is stated that some sellers have quoted low prices more to bring down quotations of competition than to actually secure orders. On moderate sized lots 7¾c. per lb. appears to be the inside quotation. Unusually large lots have sold at 7¼c. per lb. and in a few cases at 7c. per lb. but the latter figure has not been a general quotation, in fact very few sales have gone through as low as 7c. per lb. Producing costs are holding up and contract prices for chrome ore for 1924 delivery would not lead to the belief that bichromate of soda would go to lower levels for next year delivery. Exports of bichromate from Great Britain for the first 10 months of the year were 4,618,880 lb. as compared with 3,559,248 lb. in the corresponding period last year.

Caustic Soda—Fair call for export is reported although outward shipments this year to date do not compare favorably with those for last year, the decline being about 16,000 tons. Good demand is reported for home consumption and the quoted prices are holding at 3.10@3.15c. per lb. for standard drums in carlots at works. Among the buyers this week the glass trade was reported to be prominent.

Cyanide of Soda—Sales of imported cyanide were reported last week on a basis of 19c. per lb. Domestic grades vary in price according to seller and grade with 21@22c. per lb. as the open quotation. Imports of cyanide in October were 2,053,420 lb. as compared with 1,771,376 lb. in October last year. In the 10-month period imports were 19,124,430 lb. in 1923 and 9,234,122 lb. in 1922.

"Chem. & Met." Weighted Index of Chemical Prices

Base = 100 for 1913-14

This week	**165.09**
Last week	164.73
Dec., 1922	165.00
Dec., 1921	145.00
Dec., 1920	189.00
Dec., 1919	245.00
Dec., 1918	277.00

The index number for chemicals and allied products was higher on sales of crude cottonseed oil at 10⅛c., f.o b. mills. The uplift amounted to 36 points.

Nitrite of Soda—The trade was interested in a report from Washington to the effect that a suit had been instituted against the Tariff Commission, asking that production costs and other data of domestic producers, as given in the application for an increase in the duty, be made public and that a hearing be held where agents of the commission might be cross-examined. This case also may center about the validity of the flexible features of the tariff. Moderate buying has featured the market with very little domestic goods offered in eastern markets. Prices are quoted at 7¾c. per lb. although sales are said to have been made at 7½c. per lb. Imports of nitrite in October were 78,537 lb. valued at $3,324.

Prussiate of Soda—The market was quiet but if anything the position was steadier. Spot holdings were quoted at 11½c. per lb. and upward according to seller and quantity. Shipments held at 11@11½c. per lb.

Miscellaneous Chemicals

Arsenic—There was considerable interest in this material but buyers were not active and business was slow in all positions. Conditions surrounding the market were more generally understood after the recent meeting of the trade. The outlook for an adequate supply for next year has caused many to believe that prices will not go higher and there is not much incentive to speculative trading. The present rate of domestic production if continued would result in a home supply of 18,000 tons for 1924 which would be a record output. Spot arsenic sold at 13¾c. per lb. early in the week but later there were free offerings at that figure and buyers would not pay the price. Forward positions are quoted at 13½@13¾c. per lb.

Bleaching Powder—Deliveries from works are of fair volume but new business is quiet and there is no indication of improvement. Prices remain at $1.25 per 100 lb. in drums, carlots, at works, for prompt and forward positions. Liquid chlorine is easy with reports from the paper mills that they can buy at 2¾c. per lb. Reports in trade circles are that sales have been made at 2.80c. per lb. The open quotation of producers is 3c. per lb.

Formaldehyde—Producers reported a quiet market, but no important price changes took place. Quotations at the close were considered nominal at 10½@10¾c. per lb., immediate delivery. The undertone was barely steady.

Tin Oxide—Leading producers offered tin oxide at 51c. per lb., indicating that the market underwent no change in the past week. The undertone in nearly all quarters was firm as the metal scored another advance. One producer was credited with offering material at concessions from the 51c. basis.

Sal Ammoniac — Foreign material was offered quite freely and scattered business in spot goods went through at 6¼c. per lb. On futures importers were sellers at 6½c. per lb. The domestic product closed the week unchanged.

Calcium Chloride — Domestic producers say that business has been seasonal, the cement industry taking usual requirements. Stocks do not appear to be burdensome and quotations were maintained on the basis of $21 per ton on the fused, and $27 per ton on the granular, in drums, carload lots, f.o.b. works.

Epsom Salt—Fairly steady prices obtained for epsom salt, the market abroad showing little change in some time now. Importers generally held out for $1.05 per 100-lb. on the technical grade, with a possibility of doing slightly better on a round lot.

Antimony — Trading moderate with offerings of Chinese on spot at 8¾c. per lb., f.o.b. cars, New York. Cookson's "C" grade offered at 19¾@11c. per lb. Chinese needle antimony, lump, 6½@7c. per lb. Standard powdered needle, 200 mesh, 7@8c. per lb. White oxide, Chinese, 99 per cent, 7½c. per lb.

Zinc Oxide — With no important change in the metal the market for oxide held on the round lot basis of 8c. per lb., American process, lead free. On the leaded grades, American process, asking prices ranged from 7@7½c. per lb. French process, red seal, was offered by first hands at 9¾c. per lb., with the green seal at 10¾c. and the white seal at 12c. Demand for zinc oxide has been fair only.

Alcohol

Trading in denatured alcohol was described as good and prices ruled firm in nearly all directions. No. 5 completely denatured held at 44½c. per gal., carload lots, drums extra. Formula No. 1, special, 190 proof was offered by leading interests at 45½c. per gal., carload basis, drums extra. U.S.P. ethyl spirits held nominally at $4.78@$4.80 per gal., tax paid, cooperage basis. There was little if any change in methanol, prices holding nominally on the basis of 90c. per gal. for the pure, tank cars, works.

Charles W. Erskine Dead

Charles W. Erskine, for many years treasurer of Rogers-Pyatt Shellac Co., died last Wednesday at his home in New York City. Mr. Erskine was formerly associated with the John Erskine Silk Co., prior to entering the shellac business.

Coal-Tar Products

Crudes Unchanged in Quiet Market—Phenol Steady on Smaller Offerings—British Exports Gain

PRICE changes in the market for coal-tar products were few and rather unimportant. In a general way the undertone was steady. Phenol attracted more attention, the offerings being smaller because of recent trading involving round lots for forward delivering. The benzene situation was without change, supplies being ample for current needs. Producers of benzene said that stocks of the motor grade are no longer burdensome. Export demand was in evidence, but trading in this direction did not loom up large, because of lower prices named by British operators.

Latest statistics covering foreign trade of Great Britain reveal that shipments of coal-tar products show substantial gains. For the 10 months ended Oct. 31 exports of benzene from Great Britain amounted to 1,566,140 gal., which compares with 57,300 gal. for the corresponding period a year ago. The exports of tar oil and creosote oil for the 10 months reached the total of 42,691,654 gal., comparing with 21,244,314 gal. for the same time a year ago. Naphthalene shipments out of Great Britain for the 10 months ended with October were placed at 170,934 cwt., which compares with 24,940 cwt. for the corresponding period a year ago. Phenol exports proved an exception, the shipments amounting to 116,579 cwt. for the 10 months, against 124,721 cwt. in 1922. Coal-tar dyestuffs exports for the 10 months ended Oct. 31 amounted to 100,338 cwt., comparing with 39,195 cwt. a year ago.

Importations of crude naphthalene into the United States for the 10 months ended with Oct. 31, according to official statistics, amounted to 17,796,899 lb., valued at $505,370, which compares with 2,066,274 lb., valued at $34,421 for the same period a year ago.

Market Reports in Detail

Aniline Oil—Leading producers report production up to normal. Demand has been fair and contracts were closed within the past week or so on the old basis of 16c. per lb., drums extra, carload lots. On less than carloads business operators were asking from 16½@17c. per lb. Aniline oil for red was nominal around 40c. per lb.

Benzene—Nothing occurred to change the outlook so far as the immediate future was concerned. Producers are able to take care of the output in better shape, as stocks of the motor grades have been reduced materially in the past month or so. But with no real change in the motor fuel situation prices held just about steady. Export call was around, but no important trading developed. Leading producers quote 21c. as the market for 90 per cent benzene, tanks, f.o.b. works, but in outside quarters scattered lots could have been picked up at moderate concessions. The pure grade held at 23c. asked, tanks, f.o.b. point of production.

Beta-Naphthol—There was a fair demand for this intermediate and producers regarded the market as firm at the advance announced a short time ago. The carload quotation was repeated at 25c. per lb., prompt and forward delivery. On less than carload business 26c. was asked.

Creosote — Manchester reports a higher market on continued buying by America. Nominal quotations for creosote oil in the British market now range from 9@9½d. per gal., works.

Cresylic Acid—Regarding prices the views of traders differed considerably, especially on the pale 97 per cent grade. Ordinary stuff appeared plentiful and prices were irregular throughout the week. Some traders thought that prices were at or near bottom. The 97 per cent grade closed nominally at 75@80c. per gal., with the 95 per cent grade at 70@72c., and crude at 65c.

Naphthalene—The market closed unchanged. With no change in the crude situation offerings of refined on the old basis continued. Flake for shipment held nominally at 6@6¼c. per lb., depending upon the quantity and seller. On ball the market stood at 6¾@7c. per lb. Chips were offered at 5@5½c. per lb., according to quantity and seller. Crude is quoted in the English market at prices ranging from £6@£11 per ton, works, the inside figure obtaining on rather poor-quality goods.

Phenol — Producers take a firmer view of the situation, but up to the close no price changes were reported. However, several handlers did not care to meet the 25c. price for prompt shipment business. Open quotations at the close ranged from 25@26c. per lb., in drums. On futures 25c. was named. Demand showed improvement.

Pyridine — Several parcels arrived from abroad in the past week. The market was unsettled on freer offerings and spot quotations at the close were little more than nominal, ranging from $4.50@$5 per gal. Early 1924 delivery was offered at $4 per gal. Demand for futures was quiet. Reports to the effect that domestic production was making more headway created an easier feeling in consuming circles.

Salicylates—There was some talk of a higher market, but producers did not come out with any open announcement. Prevailing prices are said to be near cost and with any sustained buying an advance is more than probable. Inquiry has been fair of late, both in an export and domestic way.

Financial

The Certain-teed Products Corporation has announced quarterly dividends of 1¾ per cent on the first and second preferred stocks of the corporation.

The Mathieson Alkali Works has declared a dividend of 1¾ per cent on account of accumulations and a regular quarterly 1¾ per cent on the preferred.

Time for deposit of stock of the American Cotton Oil Co. in exchange for common stock of the newly formed Gold Dust Corporation expired Dec. 10, and the committee reports that approximately 90 per cent of this stock was so deposited.

The General Aluminum & Brass Mfg. Co. has declared a dividend of 2 per cent on its common stock. This is the first dividend on the common since 1920, when 9 per cent was paid in cash besides 5 per cent in stock. Until 1920 the company held an enviable dividend record, having paid a total of 157½ per cent in cash and 180 per cent in stock dividends since its organization in 1913.

Latest Quotations on Industrial Stocks

	Last Week	This Week
Air Reduction	*68	67½
Allied Chem. & Dye	66¼	67½
Allied Chem. & Dye pfd	109½	109⅝
Am. Ag. Chem	12	11
Am. Ag. Chem. pfd	35½	35¼
American Cotton Oil c'f's	9	9⅝
American Cyanamid	*88	*86
Am. Drug Synd	5½	5⅝
Am. Linseed Co.	16¾	16
Am. Linseed pfd	32	32¾
Am. Smelting & Refining Co	59¼	57¼
Am. Smelting & Refining pfd	95½	95⅝
Archer-Daniels Mid. Co., w.i.	*22	*20½
Archer-Daniels Mid. Co. pfd	*88½	*89
Atlas Powder	52⅝	*52¼
Casein Co. of Am	*65	*65
Certain-Teed Products	30	*32
Commercial Solvents "A"	38	44½
Corn Products	133⅝	145½
Corn Products pfd	119½	121½
Davison Chem.	69⅝	77¾
Dow Chem. Co	*47	*47
Du Pont de Nemours	125⅝	132½
Du Pont de Nemours db	*86	86½
Freeport-Texas Sulphur	13	12⅝
Grasselli Chem.	*125	*125
Grasselli Chem. pfd	*105	*105
Hercules Powder	*110	*110
Hercules Powder pfd	*104	*104
Heyden Chem.	*1	*1
Int'l Ag. Chem. Co	*1	⅛
Int'l Ag. Chem. pfd	5⅝	5
Int'l Nickel	11½	14⅛
Int'l Nickel pfd	80	81
Int'l Salt	*89½	*89½
Mathieson Alkali	46	43¼
Merck & Co	*65	*67
National Lead	126	129½
National Lead pfd	111..	111½
New Jersey Zinc	*150	*150
Parke, Davis & Co	*78	*78
Pennsylvania Salt	*91½	*85
Procter & Gamble	*135	*135
Sherwin-Williams	29	29½
Sherwin-Williams pfd.	*100	*100
Tenn. Copper & Chem	8⅞	9
Texas Gulf Sulphur	59⅝	58
Union Carbide	55¾	5
United Drug	78	*79
United Dyewood	39⅞	*38½
U. S. Industrial Alcohol	62	63½
U. S. Industrial Alcohol pfd	*98	*97
Va.-Car. Chem. Co	9	8½
Va.-Car. Chem. pfd	*30	29

*Nominal. Other quotations based on last sale.

Vegetable Oils and Fats

Consumers Buy Nearby Linseed and China Wood Oils—Crude Cottonseed Steady—Extra Tallow Lower

STEADY buying of prompt and nearby material featured the market for vegetable oils. One of the largest manufacturers of linoleum purchased linseed oil for January shipment. Varnish makers took hold of china wood oil in a fairly large way, while soap makers were buyers of tallow at a reduction in price. Consumers of refined cottonseed oil entered the market more frequently. The final report on the 1923 cotton crop attracted much attention, production being somewhat larger than expected.

Cottonseed Oil—Crude oil sold at prices ranging from 9¼@9½c. per lb., tank cars, f.o.b. point of production, the top figure obtaining late in the week on shipments from the Southeast. Trading in crude was along routine lines, mills refusing to offer freely at prevailing prices. In the option market for prime summer yellow oil the situation was somewhat different, prices developing irregularity on persistent selling of futures by refiners as well as local speculative interests. The weakness, however, was not pronounced as the South continued to buy rather freely. The cotton report mixed up sentiment quite a little and in the event of a crop of more than 10,000,000 bales quite a number of traders now believe that more than enough oil will be available for the season. Private estimates on November consumption ranged from 200,000 to 225,000 bbl. A year ago the distribution in November was a little more than 272,000 bbl. Cash trade in refined oil showed improvement, but prices covered a wide range, actual sales passing at 11@12c. per lb., in bbl. Lard compound closed at 13¼@13½c. per lb., carload lots, with business fairly active at times.

Linseed Oil—Crushers talked steady prices for nearby oil, stocks being rather light, especially in eastern territory where arrivals of seed have been small for several months. Reduced estimates, of a private nature, on the new Argentine crop helped matters from the sellers' standpoint. Inquiry for January-February oil was in evidence all week, but most bids were slightly under the market. One round lot of January oil was taken by a linoleum maker, but the terms of sale were not divulged. Early in the week 90c. could have been shaded in January oil, cooperage basis, but later 91c. appeared to be inside. December closed at 91c. per gal. March-April-May settled at 88@90c., according to seller, with May forward at 84c. per gal., carload lots, cooperage basis. The Buenos Aires option market advanced sharply late in the week on reports of rains, prospects for late harvest and higher exchange. Trade authorities believe that some damage has occurred to the growing crop and private estimates on production have been reduced. The exportable surplus may not exceed 50,000,000 bu., according to one operator with Argentine connections. Consumers, on the other hand, consider an exportable surplus of this size as a bearish factor. Crop news from India was generally favorable and a normal acreage is expected. Importations of flaxseed into the United States for the 10 months ended with October 31 amounted to 22,335,507 bu., against 11,869,992 bu. a year ago.

Final Cotton Crop Estimate Shows Reduced Yield

The final estimate on the 1923 cotton crop was issued by the Department of Agriculture on December 12. Total production was placed at 10,081,000 bales. The report shows a decline of 167,000 bales from the November estimate, but proved to be better than most traders anticipated. At the December 1 average farm price of 31c. per lb. the crop is valued at $1,494,613,230, making it the fourth most valuable cotton crop ever grown. A revised estimate on production will be made later based on ginning returns. Production for the past 10 years follows:

	Bales of 500 Lb.
1923	10,081,000
1922	9,761,817
1921	7,953,641
1920	13,439,603
1919	11,420,763
1918	12,040,532
1917	11,302,375
1916	11,449,930
1915	11,191,820
1914	15,905,840

Castor Oil—Reflecting high cost of castor beans the market closed firm at 14c. per lb. for the No. 3 grade, in bbl. Operators expect prices to hold until new crop Indian seed becomes available in quantity.

China Wood Oil—More than 20 tank cars of nearby wood oil were purchased by varnish makers late in the week on the basis of 19¾c. per lb., f.o.b. Pacific coast ports. Later 20c. was asked on tank car business. In New York oil held at 21@21½c. per lb., in bbl., immediate and nearby delivery.

Coconut Oil—Moderate trading in Ceylon type oil at 8¾c. per lb., tank cars, f.o.b. New York. On the Pacific coast December-January oil was offered at 8½c., with January forward at 8¼c. Market steady.

Corn Oil—Crude oil sold at 9⅞@10c. per lb., tank cars, f.o.b. point of production.

Palm Oils—Bids for Lagos at 7½c. turned down; holders firm at 7¾c. on genuine material. Niger spot nominal at 6¾c., with futures steady at 7c. per lb. Demand quiet.

Sesame Oil—Refined oil for shipment from abroad offered at 11¾c. per lb., c.i.f. New York.

Soya Bean Oil—Crude for shipment from Orient was offered at 7.15c. per lb., bulk basis, c.i.f. Pacific coast ports.

Fish Oils—Newfoundland tanked cod oil firm at 68@70c. per gal. Last sales in crude menhaden went through at 47½c. Stocks on Atlantic coast practically cleaned up.

Tallow, Etc.—Several cars of extra tallow sold at 7¾c. per lb., a decline of ½c. per lb. Market steady at close. Yellow grease offered at 6c. per lb., with supplies liberal. Oleo stearine sold recently at 10¾c. per lb. No. 1 oleo oil nominal at 15¾@16c. per lb., in bbl.

Miscellaneous Materials

Casein—Offerings on spot were reported at prices ranging from 11@12c. per lb. Demand was moderate and undertone barely steady on selling pressure in futures for shipment from South America. Imports of casein for the 10 months ended with October amounted to 23,890,465 lb., which compares with 11,554,290 lb. for the corresponding period a year ago.

Glycerine — Last sales of dynamite glycerine went through at 15½c. per lb., carload lots, but most holders continue to quote the market at 16c. per lb. Chemically pure nominally unchanged at 16½c per lb. Crude, soap-lye, sold recently at 10½c. per lb., loose, f.o.b. point of production. Imports of crude for the 10 months ended with October amounted to 13,635,259 lb., against 1,292,622 lb. a year ago.

Naval Stores — Southern markets were steady and prices for turpentine locally held around 93c. per gal., in bbl. Demand was fair. Rosins were firmer, the lower grades closing at $5.65@$5.75 per bbl.

White Lead—The market was firm in sympathy with the metal, but corroders announced no change in the selling schedule. Standard dry white lead, basic carbonate, was offered by leading producers at 9¼c. per lb., in casks, carload basis.

Magnesite — Market for the Californian good. Crude offered at $14 per ton; calcined $35@$37, f.o.b. shipping point, California. Dead-burned magnesite in sacks, $40@$42, Chester, Pa.; in bulk, $32@$34, Chewelah, Wash. Caustic calcined, Grecian, $50@$51, c.i.f. New York.

Talc—Ground talc, 150 to 200 mesh, $6.50@$8.50 per ton, bags extra, Vermont. Roofing grades, $6@$7 per ton; paper grades, $9@$14; Vermont. Through 20 to 50 mesh, $7@$9 per ton; 100 to 200 mesh, $8@$16; steel workers' crayons, $1.25@$2.25 per gross, Vermont mills. Gray-white, $8; yellow, $9; red, $12; North Carolina, Grade A, 350 mesh, $22; grade B, 300 mesh, $18; grade C, $12 per ton, f.o.b. New York. Double air-floated talc, 325 mesh, $14.75 per ton.

Imports at the Port of New York

December 7 to December 13

ACIDS—Cresylic—50 dr., Glasgow, Order. **Oxalic**—30 csk., Rotterdam, R. W. Greeff & Co. **Tartaric**—20 bbl., Marseilles, Order.

ALBUMEN—18 cs., Shanghai, Balfour, Williamson & Co.; 90 cs., Shanghai, Lee, Higginson & Co.; 20 cs., Shanghai, Bank of New York & Trust Co.

ALCOHOL—4 bbl. butyl, Havre, Anchor Forwarding Co.; 25 bbl. denatured, Arecibo, C. Esteva; 50 dr. do., Arecibo, Lamborn & Co.; 40 bbl. denatured, San Juan, C. Esteva; 50 dr., San Juan, Lamborn & Co.

AMMONIUM CARBONATE — 28 pkg. Liverpool, Brown Bros. & Co.

ANTIMONY—150 bbl., Havre, Heemsoth Basse Co.; 500 cs. regulus, Changsha, Nassau Smelting & Refining Co.; 100 cs. crude and 500 cs. regulus, Shanghai, Bank of America; 500 cs. regulus, Shanghai, Order; 100 cs. crude and 500 cs. regulus, Shanghai, C. Gitlan; 200 cs. regulus, Hamburg, Order.

ANTIMONY OXIDE — 200 cs. white, Shanghai, C. Gitlan.

ARSENIC—284 bbl., Piraeus, Order; 109 csk., Rotterdam, American Express Co.; 600 csk., Bremen, Bank of America; 240 bbl., Tampico, American Smelting & Refining Co.; 92 bbl., Tampico, American Metal Co.

ASBESTOS—22 bg. white, Hamburg, O. Weingarten.

BARYTES—20 bg., Liverpool, American Express Co.

BAUXITE — 570,000 kilos, Rotterdam, Bank of America; 300 tons, Malta, Canadian Carborundum Co.

BRONZE COLOR—37 cs., Bremen, Baer Bros.

CASEIN—834 bg., Buenos Aires, Bank of America; 350 bg., Buenos Aires, Brown Bros. & Co.

CALCIULM CARBIDE—400 dr., Havana, Union Carbide Sales Corp.

CALCIUM CHLORIDE—312 dr., Hamburg, Globe Shipping Co.

CHALK—933 bg. and 300 csk., Bristol, H. J. Baker & Bros.; 1,000 tons (bulk), Dunkirk, Kidder, Peabody & Co.; 1,000 tons, Dunkirk, J. W. Higman & Co.; 1,909 tons, Dunkirk, Taintor Trading Co.; 500 bg., Antwerp, Reichard-Coulston, Inc.

CHEMICALS—10 bbl., Havre, Order; 154 csk., Hamburg, Jungmann & Co.

CHINA CLAY—100 bg., Bristol, Order; 220 bg., Bristol, C. T. Wilson & Co.; 50 csk., Bristol, English China Clay Sales Corp.

COLORS—111 csk. earth, Bremen, Heller & Merz Co.; 31 csk. earth, Bremen, L. H. Butcher & Co.; 3 csk. aniline, Havre, Irving Bank-Col. Trust Co.; 3 cs. do., Havre, Order; 19 csk. aniline, Havre, Sandoz Chemical Works; 11 cs. do., Havre, Schall & Co.; 2 cs. do., Havre, Ackerman Color Co.; 10 csk., Bremen, Kuttroff, Pickhardt & Co.; 18 pkg. aniline, Havre, Sandoz Chemical Works; 26 csk., Havre, Reichard-Coulston, Inc.; 10 pkg., Havre, Am. Exchange Nat'l Bank; 18 pkg. aniline, Hamburg, Kuttroff, Pickhardt & Co.; 2 bbl. do., Hamburg, Order.

COPRA — 58 bg., Humacao, Franklin Baker Co.

COPRA CAKE—7276 bg., Manila, Spencer, Kellogg & Sons.

COPPERAS—55 bbl., Liverpool, Order.

CREAM TARTAR—40 bbl., Marseilles, Order.

DIVI-DIVI—900 bg., Curacao, R. Desvernine.

FULLERS EARTH—265 bg., Bremen, C. B. Chrystal, Inc.

FUSEL OIL—10 dr., Sourabaya, Banque Belge Pour l'Etranger.

FUSTIC—2,326 pcs., Central Pacific ports, C. H. Pearson & Son.

GLAUBER SALT — 87 bbl., Hamburg, Superfos Co.

GRAPHITE—776 bg., Marseilles, H. W. Peabody & Co.

GUMS—10 bg. copal, Liverpool, United States Varnish Co.; 57 bg. copal, Havre, L. C. Gillespie & Sons; 100 cs. damar and 150 cs. copal, Singapore, Guaranty Trust Co.; 140 bg. copal, Singapore, Baring Bros. & Co.; 140 bg. copal, Singapore, Irving Bank-Col. Trust Co.; 200 cs. damar, Batavia, Fidelity International Trust Co.; 200 cs. damar, Batavia, Order; 200 cs. damar, Batavia, Order; 140 bg. copal, Singapore, A. Klipstein & Co.; 190 cs. damar, Singapore, Order; 250 cs. damar, 103 pkg. copal, Singapore, Order; 300 cs. damar, Batavia, Order; 143 bg. copal, Manila, Central Union Trust Co.

IRON OXIDE—160 bg., Bristol, G. Z. Collins & Co.; 35 csk., Bristol, J. Lee Smith & Co.; 20 csk., Bristol, Order; 217 bbl., Malaga, Reichard-Coulston, Inc.; 62 bbl., Malaga, E. M. & F. Waldo; 16 bbl., Malaga, Order; 25 bbl., Malaga, C. J. Osborn & Co.; 130 bbl., Malaga, American Exchange National Bank; 25 bbl., Malaga, C. D. Chrystal & Co.; 28 csk., Liverpool, J. A. McNulty; 25 csk., Liverpool, Order.

LITHOPONE—515 csk., Antwerp, E. M. & F. Waldo.

LOGWOOD EXTRACT—105 bbl., Cape Haitian, Logwood Mfg. Co.; 2 bbl., Cape Haitian, A. E. Paterson; 20 csk., Kingston, West Indies Chemical Works.

MAGNESIUM CARBONATE — 112 cs. and 112 csk., Liverpool, E. Hill's Son & Co.

MANGANESE ORE—479 bg., Santiago, D. C. Andrews & Co.

Coal-Tar Dye Imports at New York Increase

The imports of coal-tar dyes for November, 1923, through the port of New York, totaled 278,673 lb., with an invoice value of $289,689. The following table shows the monthly imports through the port of New York for the year 1923:

Month	Lb.	Value
January*	179,309	$185,344
February	191,709	199,690
March	312,809	301,436
April	242,022	256,751
May	261,869	292,340
June	247,174	257,803
July	144,687	142,428
August	178,164	194,164
September	124,665	128,544
October	267,556	257,084

*Not complete.

In addition to the above imports of dyes through the port of New York, the following imports were reported for the month of November through Boston and Cincinnati; Boston, 10,677 lb., valued at $13,461; and Cincinnati, 1,479 lb. valued at $376.

MANGROVE BARK—1,000 bg. extract, Singapore, Order.

MYROBALANS—6,261 pkt. whole, Bombay, Mechanics & Metals National Bank; 481 pkt. crushed, Calcutta, Order.

NAPHTHALINE—1,044 bg., Rotterdam, Lunham & Reeve.

OCHER—36 csk., Marseilles, Reichard-Coulston, Inc.; 121 csk., Marseilles, J. Lee Smith & Co.; 45 bbl., Malaga, C. J. Osborn & Co.; 30 bbl., Marseilles, C. F. Gledehill.

OILS—China Wood—12 csk., Hong Kong, Bank of the Manhattan Co.; 59 bbl., Hong Kong, Innes & Co.; 59 bbl., Hong Kong, Standard Bank of South Africa; 276 bbl., Hankow, National City Bank; 114 bbl., Hankow, Order. **Coconut**—787 tons (bulk), Manila, Order; 21 pipes, Cochin, Volkart Bros.; 93 hhd., Cochin, Order; 880 tons (bulk), Manila, Spencer Kellogg & Sons. **Cod**—150 csk., St. Johns, Order. **Fish**—500 bbl., Glasgow, Order. **Palm**—30 csk., Liverpool, Order. **Sesame**—119 bbl. refined, Rotterdam, Fontana Bros., Inc.

OIL SEEDS—Castor—1,700 bg., Pernambuco, Baker Castor Oil Co.; 21 bg., Port de Paix, H. Mann & Co.; 3,419 bg., Bombay, Order; 2,732 bg., Cocanada, Volkart Bros.; 10,182 bg., Cocanada, Order. **Linseed**—17,989 bg., Rosario, Order.

PLUMBAGO—400 bbl., Colombo, New York Trust Co.

PYRIDINE—12 dr., Rotterdam, Lunham & Reeve; 4 bbl., Havre, Cadwallader & Co.

POTASSIUM SALTS—28 csk. carbonate, Bremen, P. H. Petry & Co.; 100 csk. nitrate, Rotterdam, Superfos Co.; 101 csk. caustic, Hamburg, Roessler & Hasslacher Chem. Co.; 20 cs. carbonate, Hamburg, Innis, Speiden & Co.; 3,000 bg. sulphate, Bremen, Potash Importing Corp. of Am.

QUEBRACHO—9,723 bg., Buenos Aires, Fourth Atlantic National Bank of Boston; 20,333 bg., Buenos Aires Tannin Corp.; 20,036 bg., Buenos Aires, Tannin Corp.; 2,033 bg., Buenos Aires, Order.

QUICKSILVER — 400 flasks, Genoa, Order; 25 flasks, Tampico, G. Ramos.

SAL AMMONIAC—100 csk., Bristol, C. De P. Field Co.; 71 bbl., Hamburg, Hans Hinrichs Chem. Corp.; 66 bbl., Hamburg, E. Suter & Co.

SHELLAC—100 cs., Marseilles, Order; 50 bg., Calcutta, Equitable Trust Co.; 600 bg., Calcutta, Anglo-South American Bank; 70 bg. garnet, Hamburg, Kasebier-Chatfield Shellac Co.; 50 bg., Hamburg, Order; 47 bg., Hamburg, Order.

SODIUM SALTS—168 cs. cyanide, Marseilles, Asia Banking Corp.; 50 cs. cyanide, Liverpool, E. Suter & Co.; 53 dr. sulphite, Hamburg, C. S. Grant & Co.; 32 bbl. fluoride, Hamburg, E. Suter & Co.; 34,865 bg. nitrate, Mejillones, W. R. Grace & Co.; 250 bbl. sulphide, Hamburg, Brown Bros. & Co.; 30 kg. hydrosulphite, Liverpool, Kuttroff, Pickhardt & Co.; 20 dr. cyanide, Liverpool, K. Buck & Co.

SUMAC EXTRACT — 25 csk., Glasgow, American Dyewood Co.

TARTAR — 227 bg., Marseilles, Royal Baking Powder Co.; 852 bg., Marseilles, C. Pfizer & Co.; 189 bg., Marseilles, Order; 70 bg., Marseilles, Tartar Chemical Co.; 254 bg., Lisbon, C. Pfizer & Co.

WAXES—344 bg. carnauba, Para, Order; 149 bg. bees, Lisbon, London & Brazilian Bank; 180 pkg. bees, Lisbon, Order; 225 bg. montan, Bremen, North German Lloyd; 154 bg. carnauba, Pernambuco, National City Bank; 46 bg. do., Pernambuco, W. R. Grace & Co.; 11 bg. bees, Ponce, D. Steengrafe; 206 bg. ozokerite, Malta, Strohmeyer & Arpe Co.; 225 bg. montan, Bremen, W. Schall & Co.; 356 bg. carnauba, Rio de Janeiro, American Trading Co.; 8 bg. bees, La Romana, Curacao Trading Co.; 26 bg. bees, Havana, Order; 33 bg. bees, Liverpool, Order.

WHITE LEAD — 70 bbl. and 100 cs., Malta, Fezandie & Sperrle.

ZINC OXIDE—100 bbl., Antwerp, Philipp Bros., Inc.

Additional Imports Week Ended Dec. 6

SULPHUR—12 csk. colloidal, London, T. J. Markernon.

SUMAC—700 bg. ground, Palermo, R. Neumann & Co.; 200 bbl. Palermo, Order; 1,050 bg. ground, Palermo, Order.

TALC — 250 bg., Genoa, Gallagher & Ascher; 900 bg., Bordeaux, L. A. Salomon & Bros.; 400 bg., Bordeaux, Moore & Munger; 300 bg., Bordeaux, Hammill & Gillespie; 200 bg., Bordeaux, Whittaker, Clark & Co.; 200 bg., Bordeaux, C. B. Chrystal & Co.

TARTAR—60 bbl., Hamburg, Order; 39 csk., Naples, Tartar Chemical Works; 482 sk., Marseilles, C. Pfizer & Co.; 1,092 sk., Marseilles, Tartar Chemical Works; 64 csk., Naples, Tartar Chemical Works; 95 bg., Bordeaux, Order.

VANADIUM — 3,600 bg., Callao, Vanadium Corp. of America.

WAXES—58 pkg. vegetable, South Pacific Ports, Heilbronn, Wolff & Co.; 45 bg. beeswax, Lisbon, Order; 600 bg. montan, Hamburg, Fidelity Int'l Trust Co.; 50 cs. spermacetti, Glasgow, Strohmeyer & Arpe Co.; 4 pkg., Valparaiso, W. E. Peck & Co.; 249 bg. carnauba, Pernambuco, Order; 145 bg. carnauba, Ceara, International Acceptance Bank; 352 bg., do., Ceara, Order; 30 pkg. bees, Aden, Order; 54 bg. montan, Hamburg, National City Bank; 24 pkg. bees, London, Order; 200 bg. bees, Hamburg, Guaranty Trust Co.; 30 bg. bees, Rotterdam, Ponds Extract Co.; 1,600 bg. paraffine, London, Asiatic Petroleum Co.; 24 bg. bees, London, Order.

WOOL GREASE — 90 csk., Antwerp, Order; 8 cs., London, Order.

ZINC CHLORIDE — 1 csk., Melbourne, American Express Co.; 164 csk., Hamburg, Order.

ZINC SULPHIDE—2 csk., London, C. A. Sykes.

ZINC WHITE — 50 bbl., Marseilles, Reichard-Coulston, Inc.

Current Prices in the New York Market

For Chemicals, Oils and Allied Products

THESE prices are for the spot market in New York City, but a special effort has been made to report American manufacturers' quotations whenever available. In many cases these are for material f.o.b. works or on a contract basis and these prices are so designated. Quotations on imported stocks are reported when they are of sufficient importance to have a material effect on the market. Prices quoted in these columns apply to large quantities in original packages.

General Chemicals

Acetone, drums	lb.	$0.25 –	$0.25½
Acetic anhydride, 85%, dr.	lb.	.38 –	....
Acid, acetic, 28%, bbl.	100 lb.	3.38 –	3.63
Acetic, 56%, bbl.	100 lb.	6.75 –	7.00
Acetic, 80%, bbl.	100 lb.	9.58 –	9.83
Glacial, 99½%, bbl.	100 lb.	12.00 –	12.78
Boric, bbl.	lb.	.10 –	....
Citric, kegs	lb.	.47½–	.48
Formic, 85%	lb.	.12 –	.14
Gallic, tech.	lb.	.45 –	.50
Hydrofluoric, 52%, carboys	lb.	.11 –	.12
Lactic, 44%, tech., light, bbl.	lb.	.11½–	.12
22% tech., light, bbl.	lb.	.05½–	.06
Muriatic, 18° tanks	100 lb.	.90 –	1.00
Muriatic, 20°, tanks	100 lb.	1.00 –	1.10
Nitric, 36°, carboys	lb.	.04½–	.05
Nitric, 42°, carboys	lb.	.05½–	.05¾
Oleum, 20%, tanks	ton	18.50 –	19.00
Oxalic, crystals, bbl.	lb.	.12 –	.12½
Phosphoric, 50% carboys	lb.	.07½–	.08½
Pyrogallic, resublimed	lb.	1.50 –	1.60
Sulphuric, 60°, tanks	ton	9.00 –	11.00
Sulphuric, 60°, drums	ton	13.00 –	14.00
Sulphuric, 66°, tanks	ton	15.00 –	16.00
Sulphuric, 66° drums	ton	20.00 –	21.00
Tannic, U.S.P., bbl.	lb.	.65 –	.70
Tannic, tech., bbl.	lb.	.45 –	.50
Tartaric, imp., powd., bbl.	lb.	.27½–	.28
Tartaric, domestic, bbl.	lb.	.30 –	....
Tungstic, per lb.	lb.	1.20 –	1.25
Alcohol, butyl, drums, f.o.b. works	lb.	.26 –	.28
Alcohol ethyl (Cologne spirit), bbl.	gal.	4.81 –	....
Ethyl, 190 p'f. U.S.P., bbl.	gal.	4.78 –	....
Alcohol, methyl (see Methanol)			
Alcohol, denatured, 190 proof			
No. 1, special bbl.	gal.	.51½–	...
No. 1, 190 proof, special, dr.	gal.	.45½–	...
No. 1, 188 proof, bbl.	gal.	.52½–	...
No. 1, 188 proof, dr.	gal.	.48½–	...
No. 5, 188 proof, bbl.	gal.	.50½–	...
No. 5, 188 proof, dr.	gal.	.44½–	...
Alum, ammonia, lump, bbl.	lb.	.03½–	.04
Potash, lump, bbl.	lb.	.03 –	.03½
Chrome, lump, potash, bbl.	lb.	.05½–	.06½
Aluminum sulphate, com. bags	100 lb.	1.40 –	1.50
Iron free bags	lb.	2.40 –	2.50
Aqua ammonia, 26°, drums	lb.	.07 –	.07½
Ammonia, anhydrous, cyl.	lb.	.30 –	.30½
Ammonium carbonate, powd. tech., casks	lb.	.09 –	.09½
Ammonium nitrate, tech., casks	lb.	.09 –	.10
Amyl acetate tech., drums	gal.	4.50 –	4.75
Antimony oxide, white, bbl.	lb.	.07½–	.07¾
Arsenic, white, powd., bbl.	lb.	.13½–	....
Arsenic, red, powd., kegs	lb.	.15 –	.15½
Barium carbonate, bbl.	ton	68.00 –	72.00
Barium chloride, bbl.	ton	85.00 –	90.00
Barium dioxide, 88%, drums	lb.	.17½–	.18
Barium nitrate, casks	...	.07½–	.08
Blanc fixe, dry, bbl.	lb.	.04 –	.04½
Bleaching powder, f.o.b. wks., drums	100 lb.	1.25 –	....
Spot N. Y. drums	100 lb.	1.75 –	....
Borax, bbl.	lb.	.05½–	.05¾
Bromine, cases	lb.	.28 –	.30
Calcium acetate, bags	100 lb.	4.00 –	4.05
Calcium arsenate, dr.	lb.	.12½–	.14
Calcium carbide, drums	lb.	.05 –	.05½
Calcium chloride, fused, dr. wks.	ton	21.00 –	....
Gran. drums works	ton	27.00 –	....
Calcium phosphate, mono, bbl.	lb.	.06½–	.07
Camphor, cases	lb.	.86 –	.86½
Carbon bisulphide, drums	lb.	.06 –	.06½
Carbon tetrachloride, drums	lb.	.09 –	.09½
Chalk, precip.—domestic, light, bbl.	lb.	.04½–	.04¾
Domestic, heavy, bbl.	lb.	.03½–	.04
Imported, light, bbl.	lb.	.04½–	.05
Chlorine, liquid, tanks, wks.	lb.	.04 –	.04½
Contract, tanks, wks.	lb.	.03 –	....
Cylinders, 100 lb., wks.	lb.	.05½–	.06
Cylinders, 100 lb., spot	lb.	.08½–	.09
Chloroform, tech., drums	lb.	.30 –	.32
Cobalt, oxide, bbl.	lb.	2.10 –	2.25
Copperas, bulk, f.o.b. wks.	ton	20.00 –	21.00
Copper carbonate, bbl.	lb.	.18 –	.19
Copper cyanide, drums	lb.	.47 –	.50
Coppersulphate, dom., bbl.	100 lb.	4.75 –	4.90
Imp bbl.	100 lb.	4.36½–	4.50
Cream of tartar, bbl.	lb.	.22½–	.25½
Epsom salt, dom., tech., bbl.	100 lb.	1.75 –	2.00
Epsom salt, imp., tech., bags	100 lb.	1.05 –	....
Epsom salt, U.S.P., dom., bbl.	100 lb.	2.25 –	2.50
Ether, U.S.P., resale, dr.	lb.	.13 –	.15
Ethyl acetate, 85%, drums	gal.	.97 –	....
Ethyl acetate, 99%, dr.	gal.	$1.12 –	$1.15
Formaldehyde, 40%, bbl.	lb.	.10½–	.10¾
Fullers earth—f.o.b. mines	ton	18.00 –	20.00
Fusel oil, ref., drums	gal.	.... –	....
Fusel oil, crude, drums	gal.	4.15 –	4.25
Glaubers salt, wks., bags	100 lb.	1.20 –	1.40
Glaubers salt, imp., bags	100 lb.	.90 –	.95
Glycerine, c.p., drums extra	lb.	.16½–	.17
Glycerine, dynamite, drums	lb.	.16 –	....
Glycerine, crude 80%, loose	lb.	.10¾–	....
Iron oxide, red, casks	lb.	.12 –	.18
Lead:			
White, basic carbonate, dry, casks	lb.	.09¼–	.09½
White, basic sulphate, casks	lb.	.08¾–	.09
White, in oil, kegs	lb.	.11½–	.11¾
Red, dry, casks	lb.	.10½–	.10¾
Red, in oil, kegs	lb.	.13 –	.14½
Lead acetate, white crys., bbl.	lb.	.14 –	.14½
Brown, broken, casks	lb.	.13 –	.13½
Lead arsenate, powd., bbl.	lb.	.18 –	.20
Lime-Hydrated, bg, wks.	ton	10.50 –	12.50
Bbl., wks.	ton	18.00 –	19.00
Lime, Lump, bbl.	280 lb.	3.63 –	3.65
Litharge, comm., casks	lb.	.10¾–	.10½
Lithopone, bags	lb.	.07 –	.07¼
in bbl.	lb.	.07¼–	.07½
Magnesium carb., tech., bags	lb.	.08¼–	.08½
Methanol, 95%, bbl.	gal.	.93 –	....
Methanol, 97%, bbl.	gal.	.95 –	....
Methanol, pure, tanks	gal.	.90 –	....
drums	gal.	1.00 –	....
bbl.	gal.	1.05 –	....
Methyl-acetone, t'ks.	gal.	1.15 –	....
Nickel salt, double, bbl.	lb.	.10 –	.10½
Nickel salts, single, bbl.	lb.	.11 –	.11½
Phosgene	....	.60 –	.75
Phosphorus, red, cases	lb.	.... –	....
Phosphorus, yellow, cases	lb.	.35 –	.40
Potassium bichromate, casks	lb.	.09½–	....
Potassium bromide, gran., bbl.	lb.	.19 –	.20
Potassium carbonate, 80-85%, calcined, casks	lb.	.06½–	.06¾
Potassium chlorate, powd.	lb.	.07½–	.08½
Potassium cyanide, drums	lb.	.47 –	.52
Potassium, first sorts, cask	lb.	.08¼–	.08½
Potassium hydroxide (caustic potash) drums	lb.	.06¼–	.06¾
Potassium iodide, cases	lb.	3.65 –	3.75
Potassium nitrate, bbl.	lb.	.07¼–	.09
Potassium permanganate, drums	lb.	.15½–	.16
Potassium prussiate, red, casks	lb.	.55 –	.56
Potassium prussiate, yellow, casks	lb.	.25 –	.25½
Salammoniac, white, gran., casks, imported	lb.	.06¼–	.06¾
Salammoniac, white, gran., bbl., domestic	lb.	.07½–	.07¾
Gray, gran., casks	lb.	.08 –	.09
Salsoda, bbl.	100 lb.	1.20	1.40
Salt cake (bulk)	ton	24.00 –	26.00
Soda ash, light, 58% flat, bulk, contract	100 lb.	1.25 –	....
bags, contract	100 lb.	1.38 –	....
Soda ash, dense, bulk, contract, basis 58%	100 lb.	1.35 –	....
bags, contract	100 lb.	1.45 –	....
Soda, caustic, 76%, solid, drums contract	100 lb.	3.10 –	....
Soda, caustic, ground and flake, contracts, dr.	100 lb.	3.50 –	3.85
Soda, caustic, solid, 76% f. a.s. N. Y.	100 lb.	3.00 –	3.10
Sodium acetate, works, bbl.	lb.	.05¼–	.05½
Sodium bicarbonate, bulk	100 lb.	1.75 –	....
330-lb. bbl.	100 lb.	2.00 –	....
Sodium bichromate, casks	lb.	.07½–	.07¾
Sodium bisulphate (niter cake)	ton	6.00 –	7.00
Sodium bisulphite, powd., U.S.P., bbl.	lb.	.04½–	.04½
Sodium chlorate, kegs	lb.	.06½–	.07
Sodium chloride	long ton	12.00 –	13.00
Sodium cyanide, cases	lb.	.19 –	.22
Sodium fluoride, bbl.	lb.	$0.08½–	$0.10¾
Sodium hyposulphite, bbl.	lb.	.02½–	.02
Sodium nitrite, casks	lb.	.07¾–	......
Sodium peroxide, powd., cases	lb.	.28 –	.30
Sodium phosphate, dibasic, bbl.	lb.	.03½–	.04
Sodium prussiate, yel. drums	lb.	.11½–	.....
Sodium salicylic, drums	lb.	.40 –	.42
Sodium silicate (40°, drums)	100 lb.	.75 –	1.15
Sodium silicate (60°, drums)	100 lb.	1.75 –	2.00
Sodium sulphide, fused, 60-62% drums	lb.	.03 –	.04
Sodium sulphite, crys., bbl.	lb.	.03½–	.03¾
Strontium nitrate, powd., bbl.	lb.	.11½–	.12
Sulphur chloride, yel drums	lb.	.04½–	.05
Sulphur, crude	ton	18.00 –	20.00
At mine, bulk	ton	16.00 –	18.00
Sulphur, flour, bag	100 lb.	2.25 –	2.35
Sulphur, roll, bag	100 lb.	2.00 -	2.10
Sulphur dioxide, liquid, cyl.	lb.	.08 -	.08
Tin bichloride, bbl.	lb.	.13½–	.13¾
Tin oxide, bbl.	lb.	.51 –	.....
Tin crystals, bbl.	lb.	.34½–	.35
Zinc carbonate, bags	lb.	.14 –	.14½
Zinc chloride, gran, bbl.	lb.	.06½–	.06¾
Zinc cyanide, drums	lb.	.37 –	.38
Zinc oxide, , lead free, bbl.	lb.	.08 –	.08½
5% lead sulphate, bags	lb.	.07¼–	......
10 to 35 % lead sulphate, bags	lb.	.07 –	......
French, red seal, bags	lb.	.09¾–	......
French, green seal, bags	lb.	.10¾–	......
French, white seal, bbl.	lb.	.12 –	......
Zincsulphate, bbl.	100 lb.	2.75 –	3.25

Coal-Tar Products

Alpha-naphthol, crude, bbl.	lb.	$0.60 –	$0.70
Alpha-naphthol, ref., bbl.	lb.	.65 –	.80
Alpha-naphthylamine, bbl.	lb.	.35 –	.36
Aniline oil, drums	lb.	.16 –	.16½
Aniline salts, bbl.	lb.	.22 –	.23
Anthracene, 80%, drums	lb.	.75 –	.80
Anthracene, 80%, imp., drums, duty paid	lb.	.65 –	.70
Anthraquinone, 25%, paste, drums	lb.	.75 –	.80
Benzaldehyde U.S.P., carboys	lb.	1.50 –	.....
f.f.c. drums	lb.	1.60 –	.....
tech, drums	lb.	75	.....
Benzene, pure, water-white, tanks, works	gal.	.22½–	.23
Benzene, 90%, tanks, works	gal.	.21 –	....
Benzidine base, bbl.	lb.	.82 –	.86
Benzidine sulphate, bbl.	lb.	.72 –	.75
Benzoic acid, U.S.P., kegs	lb.	.85 –	88
Benzoate of soda, U.S.P., bbl.	lb.	.65 –	.70
Benzyl chloride, 95-97%, ref., carboys	lb.	.40 –	....
Benzyl chloride, tech., drums	lb.	.25 –	....
Beta-naphthol, tech., bbl.	lb.	.25 –	.26
Beta-naphthylamine, tech.	lb.	.75 –	.80
Cresol, U.S.P., drums	lb.	.25 –	.29
Ortho-cresol, drums	lb.	.28 –	.32
Cresylic acid, 97%, works drums	gal.	.75 –	.85
95-97%, drums, works	gal.	.70 –	.75
Dichlorbenzene, drums	lb.	.06 –	.08
Diethylaniline, drums	lb.	.55 –	.60
Dimethylaniline, drums	lb.	.40 –	.41
Dinitrobenzene, bbl.	lb.	.18 –	.20
Dinitrochlorbenzene, bbl.	lb.	.21 –	.22
Dinitronaphthalen, bbl.	lb.	.30 –	.32
Dinitrophenol, bbl.	lb.	.35 –	.40
Dinitrotoluen, bbl.	lb.	.20 –	.22
Dip oil, 25%, drums	gal.	.30 –	.35
Diphenylamine, bbl.	lb.	.50 –	.52
H-acid, bbl.	lb.	.75 –	.80
Meta-phenylenediamine, bbl.	lb.	1.00 –	1.05
Michlers ketone, bbl.	lb.	3.00 –	3.50
Monochlorbenzene, drums	lb.	.08 –	.10
Monoethylaniline, drums	lb.	.95 –	1.10
Naphthalene, flake, bbl.	lb.	.06 –	.06½
Naphthalene, balls, bbl.	lb.	.06½–	.07
Naphthionate of soda, bbl.	lb.	.60 –	.65
Naphthionic acid, crude, bbl.	lb.	.55 –	.60
Nitrobenzene, drums	lb.	.09½–	.10
Nitro-naphthalene, bbl.	lb.	.30 –	.35
Nitro-toluene, drums	lb.	.13½–	.14
N-W acid, bbl.	lb.	1.10 –	1.15
Ortho-amidophenol, kegs	lb.	2.30 –	2.35
Ortho-dichlorbenzene, drums	lb.	.15 –	.17
Ortho-nitrophenol, bbl.	lb.	1.20 –	1.30
Ortho-nitrotoluene, drums	lb.	.11 –	.12
Ortho-toluidine, bbl.	lb.	.14 –	.16
Para-amiñophenol, base, kegs	lb.	1.30 –	....
Para-amiñophenol, HCl, kegs	lb.	1.55 –	....
Para-dichlorbenzene, bbl.	lb.	.17 –	20
Paranitroaniline, bbl.	lb.	.72 –	.73
Para-nitrotoluene, bbl.	lb.	.60 –	.65
Para-phenylenediamine, bbl.	lb.	1.45 –	1.50
Para-toluidine, bbl.	lb.	.90 –	.95
Phthalic anhydride, bbl.	lb.	.30 –	.34
Phenol, U.S.P., dr.	lb.	.26 –	....
Picric acid, bbl.	lb.	.20 –	.22
Pyridine, dom., drums	gal.	nominal	
Pyridine, imp., drums	gal.	4.75 –	5.00
Resorcinol, tech., kegs	lb.	1.40 –	1.50

Resorcinol, pure, kegs	lb.	$2.15 –	....
R-salt, bbl	lb.	.55 –	.60
Salicylic acid, tech., bbl	lb.	.32 –	....
Salicylic acid, U.SP., bbl	lb.	.35 –	....
Solvent naphtha, water-white, tanks	gal.	.23 –	....
Crude, tanks	gal.	.20 –	....
Sulphanilic acid, crude, bbl	lb.	.18 –	.20
Thiocarbanilide, kegs	lb.	.35 –	.38
Tolidine, bbl	lb.	1.00 –	1.05
Toluidine, mixed, kegs	lb.	.30 –	.35
Toluene, tank cars, works	gal.	.24 –	....
Toluene, drums, works	gal.	.29 –	....
Xylidine, drums	lb.	.50 –	.....
Xylene, pure, drums	gal.	.50 –	.55
Xylene, com., drums	gal.	.34 –	.....
Xylene, com., tanks	gal.	.29 –	.....

Naval Stores

Rosin B-D, bbl	280 lb.	$5.65 –	....
Rosin E-I, bbl	280 lb.	5.65 –	....
Rosin K-N, bbl	280 lb.	5.70 –	$5.95
Rosin W.G.-W.W., bbl	280 lb.	6.45 –	6.80
Wood rosin, bbl	280 lb.	5.80 –	5.90
Turpentine, spirits of, bbl	gal.	.93 –	....
Wood, steam dist., bbl	gal.	.85 –	....
Wood, dest. dist., bbl	gal.	.70 –	....
Pine tar pitch, bbl	200 lb.	6.50 –	....
Tar, kiln burned, bbl	500 lb.	11.00 –	....
Retort tar, bbl	500 lb.	11.00 –	....
Rosin oil, first run, bbl	gal.	.45 –	....
Rosin oil, second run, bbl	gal.	.47 –	....
Rosin oil, third run, bbl	gal.	.50 –	....
Pine oil, steam dist	gal.	.65 –	....
Pine oil, pure, dest. dist	gal.	.60 –	....
Pine tar oil, ref	gal.	.48 –	....
Pine tar oil, crude, tanks f.o.b. Jacksonville, Fla	gal.	.32 –	.32½
Pine tar oil, double ref., bbl	gal.	.... –	.75
Pine tar, ref., thin, bbl	gal.	.... –	.25
Pinewood creosote, ref., bbl	gal.	.... –	.52

Animal Oils and Fats

Degras, bbl	lb.	$0.04 –	$0.04¼
Grease, yellow, loose	lb.	.06 –	.06¼
Lard oil, Extra No. 1, bbl	gal.	.85 –	....
Neatsfootoil 20 deg. bbl	gal.	1.32 –	....
No. 1, bbl	gal	.94 –	.96
Oleo Stearine		.10¾ –	.11
Oleo oil, No. 1, bbl	lb.	.15¾ –	.16
Red oil, distilled, d.p. bbl	lb.	.08½ –	.08¾
Saponified, bbl	lb.	.08½ –	.08¾
Tallow, extra, loose	lb.	.07¾ –	....
Tallow oil, acidless, bbl	gal.	.86 –	.88

Vegetable Oils

Castor oil, No. 3, bbl	lb.	$0.14 –	....
Castor oil, No. 1, bbl	lb.	.14½ –	....
Chinawood oil, bbl	lb.	.21 –	21½
Coconut oil, Ceylon, bbl	lb.	.09¾ –	....
Ceylon, tanks, N.Y	lb.	.08¾ –	....
Coconut oil, Cochin, bbl	lb.	.10 –	....
Corn oil, crude, bbl	lb.	.12 –	....
Crude, tanks, (f.o.b. mill)	lb.	.09¾ –	.10
Cottonseed oil, crude (f.o.b. mill), tanks	lb.	.09½ –	....
Summer yellow, bbl	lb.	.12 –	.12¼
Winter yellow, bbl	lb.	.13 –	.13¼
Linseed oil, raw, car lots, bbl.	gal.	.91 –	....
Raw, tank cars (dom.)	gal.	.85 –	....
Boiled, cars, bbl. (dom.)	gal.	.93 –	....
Olive oil, denatured, bbl	gal.	1.10 –	1.12
Sulphur, (foots) bbl	lb.	.08½ –	.08¾
Palm, Lagos, casks	lb.	.07¼ –	....
Niger, casks	lb.	.06¾ –	.07
Palm kernel, bbl	lb.	.08¾ –	.09
Peanut oil, crude, tanks (mill)	lb	.12 –	....
Peanut oil, refined, bbl	lb.	.15 –	.15½
Perilla, bbl	lb.	.14½ –	....
Rapeseed oil, refined, bbl	gal.	.77 –	.79
Rapeseed oil, blown, bbl	gal.	.83 –	.85
Sesame, bbl	lb.	.12 –	.12¼
Soya bean (Manchurian), bbl.	lb.	.... –	....
Tank, f.o.b. Pacific coast	lb.	.09¾ –	....
Tank, (f.o.b. N.Y.)	lb.	.10¼ –	.10¼

Fish Oils

Cod, Newfoundland, bbl	gal.	$0.68 –	....
Menhaden, light pressed, bbl.	gal.	.64 –	....
White bleached, bbl	gal.	.66 –	....
Blown, bbl	gal.	.70 –	....
Crude, tanks (f.o.b. factory)	gal.	47½ –	....
Whale No. 1 crude, tanks, coast	lb.	.... –	....
Winter, natural, bbl	gal.	.75 –	.76
Winter, bleached, bbl	gal.	.78 –	.79

Oil Cake and Meal

Coconut cake, bags	ton	$34.00 –	....
Cottonseed meal, f.o.b. mills	ton	43 00 –	....
Linseed cake, bags	ton	41 00 –	42.00
Linseed meal, bags	ton	44 00 –	....

Dye & Tanning Materials

Albumen, blood, bbl	lb.	$0.45 –	$0.50
Albumen, egg, tech, kegs	lb.	.95 –	.97
Cochneal, bags	lb.	.32 –	.34
Cutch, Borneo, bales	lb.	.04½ –	.04¾
Cutch, Rangoon, bales	lb.	.15 –	.16
Dextrine, corn, bags ... 100 lb.		3.69 –	3.90
Dextrine gum, bags ... 100 lb.		3.97 –	4.24
Divi-divi, bags	ton	38.00 –	39.00
Fustic, sticks	ton	30.00 –	35.00
Fustic, chips, bags	lb.	.04 –	.05
Gambier com., bags	lb.	.10½ –	.10¾
Logwood, sticks	ton	25.00 –	26.00
Logwood, chips, bags	lb.	02½ –	.03
Sumac, leaves, Sicily, bags	ton	90 00 –	.....
Sumac, ground, bags	ton	$85.00 –	$90.00
Sumac, domestic, bags	ton	40.00 –	42.00
Starch, corn, bags ... 100 lb.		3.12 –	3.22
Tapioca flour, bags	lb.	.06 –	.07

Extracts

Archil, conc., bbl	lb.	$0.16½ –	$0.20
Chestnut, 25% tannin, tanks.	lb.	.02 –	.03
Divi-divi, 25% tannin, bbl	lb.	.04 –	.05
Fustic, crystals, bbl	lb.	.20 –	.22
Fustic, liquid, 42°, bbl	lb.	.08 –	.09
Gambier, liq., 25% tannin, bbl.	lb.	.09 –	.09½
Hematine crys., bbl	lb.	.14 –	.18
Hemlock, 25% tannin, bbl	lb.	.03½ –	.04
Hypernic, solid, drums	lb.	.24 –	.26
Hypernic, liquid, 51°, bbl	lb.	.09½ –	.10½
Logwood, crys., bbl	lb.	.14 –	.15
Logwood, liq., 51°, bbl	lb.	.07½ –	.08
Quebracho, solid, 65% tannin, bbl	lb.	.05 –	.05¼
Sumac, dom., 51°, bbl	lb.	.06½ –	.07¼

Dry Colors

Blacks-Carbongas, bags, f.o.b. works, contract	lb.	$0.08 –	$0.10
spot, cases	lb.	.10 –	.14
Lampblack, bbl	lb.	.12 –	.40
Mineral, bulk	ton	35.00 –	45.00
Blues–Bronze, bbl	lb.	.45 –	.50
Prussian, bbl	lb.	.45 –	.50
Ultramarine, bbl	lb.	.08 –	.35
Browns, Sienna, Ital., bbl	lb.	.06 –	.14
Sienna, Domestic, bbl	lb.	.03½ –	.04
Umber, Turkey, bbl	lb.	.04 –	.04¼
Greens–Chrome, C.P.Light, bbl	lb.	.28 –	.30
Chrome, commercial, bbl	lb.	.12 –	.12½
Paris, bulk	lb.	.26 –	.28
Reds Carmine No. 40, tins	lb.	4.50 –	4.70
Oxide red, casks	lb.	.10 –	.14
Para toner, kegs	lb.	1.00 –	1.10
Vermilion, English, bbl	lb.	1.15 –	1.20
Yellow, Chrome, C.P. bbls	lb.	.17½ –	.18
Ocher, French, casks	lb.	.02¾ –	.03

Waxes

Bayberry, bbl	lb.	$0.25½ –	$0.26½
Beeswax, crude, Afr. bg	lb.	.22 –	....
Beeswax, refined, light, bags	lb.	.32 –	.34
Beeswax, pure white, cases	lb.	.40 –	.41
Candellila, bags	lb.	.23 –	.23½
Carnauba, No. 1, bags	lb.	.36 –	.38
No. 2, North Country, bags	lb.	.22 –	.22½
No. 3, North Country, bags	lb.	.18 –	.18½
Japan, cases	lb.	.16 –	.16½
Montan, crude, bags	lb.	.05½ –	.06
Paraffine, crude, match, 105-110 m.p., bbl	lb.	.04½ –	....
Crude, scale 124-126 m.p. bags	lb.	.03½ –	....
Ref., 118-120 m.p., bags	lb.	.04 –	....
Ref., 125 m.p., bags	lb.	.04¼ –	....
Ref, 128-130 m.p., bags	lb.	.04½ –	....
Ref., 133-135 m.p., bags	lb.	.04¾ –	.05
Ref., 135-137 m.p., bags	lb.	.05½ –	....
Stearic acid, sgle pressed, bags	lb.	.12½ –	.12¾
Double pressed, bags	lb.	.13 –	.13¼
Triple pressed, bags	lb.	.14½ –	.14¾

Fertilizers

Acid phosphate, 16%, bulk, works	ton	$8.00 –	$8.25
Ammonium sulphate, bulk f.o.b. works ... 100 lb.		$2.85 –	$2.90
Blood, dried, bulk	unit	4.10 –	4.15
Bone, raw, 3 and 50, ground	ton	26.00 –	28.00
Fish scrap, dom., dried, wks.	unit	4.40 –	....
Nitrate of soda, bags ... 100 lb.		2.45 –	....
Tankage, high grade, f.o.b. Chicago	unit	3.25 –	3.35
Phosphate rock, f.o.b. mines, Florida pebble, 68-72%	ton	4.00 –	4.50
Tennessee, 78-80%	ton	7.75 –	8.00
Potassium muriate, 80%, bags	ton	34.55 –	....
Potassium sulphate, bags basis 90%	ton	45.85 –	....
Double manure salt	ton	27.00 –	....
Kainit	ton	7.22 –	....

Crude Rubber

Para—Upriver fine	lb.	$0.23½ –	....
Upriver coarse	lb.	.19½ –	....
Upriver caucho ball	lb.	.20 –	....
Plantation—First latex crepe	lb.	.26¾ –	....
Ribbed smoked sheets	lb.	.26¾ –	....
Brown crepe, thin, clean	lb.	.26 –	....
Amber crepe No. 1	lb.	.26½ –	....

Gums

Copal, Congo, amber, bags	lb.	$0.10 –	$0.15
East Indian, bold, bags	lb.	.21 –	.22
Manila, pale, bags	lb.	.19 –	.20
Pontinak, No. 1 bags	lb.	.19 –	.20
Damar, Batavia, cases	lb.	.25 –	....
Singapore, No. 1, cases	lb.	.32 –	.33
Singapore, No. 2, cases	lb.	.21½ –	.22
Kauri, No. 1, cases	lb	.64 –	.66
Ordinary chips, cases	lb.	.21 –	.23
Manjak, Barbados, bags	lb.	.09 –	.14

Shellac

Shellac, orange fine, bags	lb.	$0.64 –	....
Orange superfine, bags	lb.	.66 –	....
A. C. garnet, bags	lb.	.65 –	....
Bleached, bonedry	lb.	.72 –	$0.73
Bleached, fresh	lb.	.60 –	....
T. N., bags	lb.	.60 –	.61

Miscellaneous Materials

Asbestos, crude No. 1, f.o.b., Quebec	sh. ton	$350.00 –	$450.00
Asbestos, shingle, f.o.b., Quebec	sh. ton	$50.00 –	$60.00
Asbestos, cement, f.o.b., Quebec	sh. ton	17.00 –	20.00
Barytes, grd., white, f.o.b. mills, bbl	net ton	15.00 –	18.00
Barytes, grd., off-color, f.o.b. Balt	net ton	13.00 –	14.00
Barytes, floated, f.o.b. St. Louis, bbl	net ton	26.00 –	.....
Barytes, crude f.o.b. mines, bulk	net ton	7.00 –	10.00
Casein, bbl., tech	lb.	.11 –	.12
China clay (kaolin) crude, f.o.b. Ga	net ton	6.00 –	8.00
Washed, f.o.b. Ga	net ton	8.00 –	9.00
Powd., f.o.b. Ga	net ton	14.00 –	20.00
Crude f.o.b. Va	net ton	6.00 –	8.00
Ground, f.o.b. Va	net ton	13.00 –	19.00
Imp., lump, bulk	net ton	15.00 –	20.00
Imp., powd	net ton	45.00 –	50.00
Feldspar, No. 1 pottery	long ton	7.00 –	8.00
No. 2 pottery	long ton	6.50 –	....
No. 1 soap	long ton	8.50 –	....
No. 1 Canadian, f.o.b. mill, powd	long ton	20.00 –	....
Graphite, Ceylon, lump, first quality, bbl	lb.	.06 –	.06½
Ceylon, chip, bbl	lb.	.04¾ –	.07
High grade amorphous crude	ton	15.00 –	30.00
Gum arabic, amber, sorts, bags	lb.	.13 –	.13½
Gum tragacanth, sorts, bags	lb.	.50 –	.55
No. 1, bags	lb.	1.35 –	1.40
Kieselguhr, f.o.b. Cal	ton	40.00 –	42.00
F.o.b. N. Y	ton	50.00 –	55.00
Magnesite, crude, f.o.b. Cal	ton	14.00 –	15.00
Pumice stone, imp., casks	lb.	.03 –	.05½
Dom., lump, bbl	lb.	.05 –	.05½
Dom., ground, bbl	lb.	.05½ –	.06
Silica, glass sand, f.o.b. Ind	ton	2.00 –	2.50
Silica, sand blast, f.o.b. Ind	ton	2.50	5.00
Silica, amorphous, 200-mesh, f.o.b. Ill	ton	20.00 –	....
Silica, glass sand, f.o.b. Ill	ton	1.50 –	3.00
Soapstone, coarse, f.o.b. Vt., bags	ton	7.00 –	8.00
Talc, 200 mesh, f.o.b., Vt., bags, extra	ton	6.50 –	8.50
Talc, 200 mesh, f.o.b. Ga., bags	ton	7.00 –	9.00
Talc, 350 mesh, f.o.b. New York, grade A bags	ton	22.00 –	....

Mineral Oils

Crude, at Wells

Pennsylvania	bbl.	$2.35 –	2.60
Corning	bbl.	1.25 –	......
Cabell	bbl.	1.20 –	......
Somerset	bbl.	1.15 –	......
Illinois	bbl.	1.22 –	......
Indiana	bbl.	1.23 –	......
Kansas and Oklahoma, 28 deg.	bbl.	.50 –	......
California, 35 deg. and up	bbl.	.76 –	......

Gasoline, Etc.

Motor gasoline, steel bbls	gal.	$0.15½ –	......
Naphtha, V. M. & P. deod, steel bbls	gal	.14½ –	......
Kerosene, ref. tank wagon	gal.	.15 –	......
Bulk, W.W. delivered, N.Y.	gal.	.09 –	......
Lubricating oils:			
Cylinder, Penn., dark	gal.	.24 –	....
Bloomless, 30@31 grav	gal.	.17½ –	....
Paraffin, pale	gal.	.16½ –	.17
Spindle, 200, pale	gal.	.21 –	.21½
Petrolatum, amber, bbls	lb.	.03½ –	.04
Paraffine wax (see waxes)			

Refractories

Bauxite brick, 56% Al_2O_3, f.o.b. Pittsburgh	1,000	$140–145
Chrome brick, f.o.b. Eastern shipping points	ton	50–52
Chrome cement, 40-50% Cr_2O_3	ton	23–27
40-45% Cr_2O_3, sacks, f.o.b. Eastern shipping points	ton	23.00
Fireclay brick, 1st. quality, 9-in. shapes, f.o.b. Ky. wks	1,000	42–45
2nd. quality, 9-in. shapes, f.o.b. wks	1,000	35–38
Magnesite brick, 9-in. straight (f.o.b. wks.)	ton	65–68
9-in. arches, wedges and keys	ton	80–85
Scraps and splits	ton	85
Silica brick, 9-in. sizes, f.o.b. Chicago district	1,000	50–53
Silica brick, 9-in. sizes, f.o.b. Birmingham district	1,000	50–53
F.o.b. Mt. Union, Pa	1,000	42–45
Silicon carbide refract. brick, 9-in.	1,000	1180.00

Ferro-Alloys

Ferrotitanium, 15-18% f.o.b. Niagara Falls, N. Y	ton	$200 00 –	$225.00

Ferrochromium, per lb. of Cr, 1-2% C	lb.	.28 - .30
4-6% C	lb.	.12 - ...
Ferromanganese, 78-82% Mn, Atlantic seabd. duty paid	gr. ton	110.00 - ....
Spiegeleisen, 19-21% Mn	gr. ton	42.00 - 45 00
Ferromolybdenum, 50-60% Mo, per lb. Mo	lb.	2.00 - 2.50
Ferrosilicon, 10-12%	gr. ton	43.00 - 50.00
50%	gr. ton	82.50 - 85.00
Ferrotungsten, 70-80%, per lb. of W	lb.	$0.88 @ $0.90
Ferro-uranium, 35-50% o U. per lb. of U	lb.	4.50 - ....
Ferrovanadium, 30-40% per lb. of V	lb.	3.50 - 4.50

Ores and Semi-finished Products

Bauxite, dom. crushed dried, f.o.b. shipping points	ton	$5.50 - $8.75
Chrome ore, Calif. concentrates, 50% min. Cr_2O_3	ton	22.00 - 23.00
C.i.f. Atlantic seaboard	ton	19.50 - 24.00
Coke, fdry., f.o.b. ovens	ton	5.00 - 5.50
Coke, furnace, f.o.b. ovens	ton	3.85 - 4.00
Fluorspar, gravel, f.o.b. mines' Illinois	ton	23.50 - ....
Ilmenite, 52% TiO_2	lb.	.00¾- .01
Manganese ore, 50% Mn c.i.f. Atlantic seaport	unit	.38 - .42
Manganese ore, chemica (MnO_2)	ton	75.00 - 80.00
Molybdenite, 85% MoS_2, per lb. MoS_2, N. Y.	lb.	.75 - ....
Monazite, per unit of ThO_2, c.i.f., Atl. seaport	lb.	.06 - .08
Pyrites, Span., fines, c.i.f Atl. seaport	unit	.11½- .12
Pyrites, Span., furnace size c.i.f. Atl. seaport	unit	.11½- .12
Pyrites, dom. fines, f.o.b. mines, Ga.	unit	.12 - ....
Rutile, 95% TiO_2	lb.	.10 - ....
Tungsten, scheelite, 60% WO_3 and over	unit	9.50 - 10.00
Tungsten, wolframite, 60% WO_3	unit	9.00 - 9.50
Uranium ore (carnotite) per lb. of U_3O_8	lb.	3.50 - 3.75
Uranium oxide, 96% per lb. U_3O_8	lb.	2.25 - 2.50
Vanadium pentoxide, 99%	lb.	12.00 - 14.00
Vanadium ore, per lb. V_2O_5	lb.	.75 - 1.00
Zircon	ton	80.00 - ....

Non-Ferrous Metals

Copper, electrolytic	lb.	.13-.13⅜
Aluminum, 98 to 99%	lb.	.26-.28
Antimony, wholesale, Chinese and Japanese	lb.	.08¼-.08½
Nickel, 99%	lb.	.27 -.30
Monel metal, shot and blocks	lb.	.32
Monel metal, ingots	lb.	.38
Monel metal, sheet bars	lb.	.45
Tin, 5-ton lots, Straits	lb.	.48
Lead, New York, spot	lb.	.07¼-.07½
Lead, E. St. Louis, spot	lb.	.07¼-....
Zinc, spot, New York	lb.	.0655
Zinc, spot, E. St. Louis	lb.	.0620
Silver (commercial)	oz.	.64½
Cadmium	lb.	.75
Bismuth (500 lb. lots)	lb.	2.55
Cobalt	lb.	3.00-3.25
Magnesium, ingots, 99%	lb.	1.25-.....
Platinum	oz.	125.00
Iridium	oz.	275.00@300.00
Palladium	oz.	83.00
Mercury 75	lb.	60.00
Tungsten	lb.	.95-1.00

Finished Metal Products

	Warehouse Price Cents per Lb.
Copper sheets, hot rolled	19.25
Copper bottoms	29.75
Copper rods	19 75
High brass wire	18 00
High brass rods	15 75
Low brass wire	20.25
Low brass rods	20.50
Brazed brass tubing	23.50
Brazed bronze tubing	27.00
Seamless copper tubing	25.50
Seamless high brass tubing	24.00

OLD METALS—The following are the dealers' purchasing prices in cents per pound:

Copper, heavy and crucible	9.00@ 9.50
Copper, heavy and wire	10.25@10.50
Copper, light and bottoms	8.50@ 8.75
Lead, heavy	5.50@ 5.62½
Lead, tea	3.50@ 3 75
Brass, heavy	6.00@ 6.25
Brass, light	5.25@ 5.50
No. 1 yellow brass turnings	5.75@ 6.00
Zinc scrap	3.75@ 4.00

Structural Material

The following base prices per 100 lb. are for structural shapes 3 in. by ¼ in. and larger, and plates ¼ in. and heavier, from jobbers' warehouses in the cities named:

	New York	Chicago
Structural shapes	$3.54	$3.54
Soft steel bars	3.54	3.54
Soft steel bar shapes	3.54	3.54
Soft steel bands	4.39	4.39
Plates, ¼ to 1 in. thick	3 64	3.64

Industrial

Financial, Construction and Manufacturing News

Construction and Operation

Alabama

CRICHTON—The Gulf Paper Co., Mobile, Ala., has tentative plans for the rebuilding of the portion of its plant near Crichton, destroyed by fire, Dec. 3, with loss estimated at $200,000, including equipment. J. M. Walsh is president, and G. H. Mackie local manager.

MONTGOMERY—The Gulf States Chemical & Refining Co., Birmingham, has leased a local building for the establishment of a plant for the production of calcium arsenate under a new electrochemical process. It is purposed to commence operations at an early date. The erection of new works is being considered in this section. A. M. Kennedy is manager.

TUSCALOOSA—The local Chamber of Commerce is in negotiation with a paper manufacturing company, whose name is temporarily withheld, for the construction of a new plant in this vicinity, and arrangements are expected to be consummated at an early date. It is said that the mill will comprise a number of units, estimated to cost more than $1,500,000, with machinery.

California

LOS ANGELES—The General Petroleum Co., San Pedro Harbor, has tentative plans under way for the rebuilding of the portion of its local storage and distributing plant destroyed by fire, Nov. 26, with loss estimated at close to $100,000, including equipment.

LOS ANGELES—A foundry and plating works will be constructed by the Ward Heater Co., 1314 South Central Ave., at its proposed new plant, estimated to cost $250,000, with equipment. Benjamin J. Bloser, Consolidated Realty Bldg., is architect.

SAN FRANCISCO—Bids will be received by the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Jan. 16, for equipment for a fuel oil storage and distributing plant at the Mare Island Navy Yard, including motor-driven foam chemical agitating pump, foam solution tanks on steel towers, centrifugal pumps, fuel oil tanks, air compressors and auxiliary equipment, all as set forth in Specification 4717.

Illinois

CHICAGO—The Giles McDaniel Co., recently organized to manufacture paints, oils, etc., has purchased a 2-story and basement building, 25x125 ft., at 1500 West Kinzie St., for a new plant. Operations will be commenced at once.

CHICAGO—The Central Lime & Cement Co., 131 North Homan Ave., manufacturer of lime, cement-plaster and kindred products, has acquired property in the West Division section, totaling about 30,000 sq.ft., for an addition to its plant.

CHICAGO—Darling & Co., Inc., 4201 South Ashland Ave., manufacturer of fertilizer products, has preliminary plans in progress for the erection of a new plant at 44th St. and Racine Ave., to cost about $350,000, with equipment, replacing its former works at this location, recently destroyed by fire. S. J. Riley, company address, is architect. C. A. Alling is president.

CHICAGO—The United Cork Companies, Inc., 110 South Dearborn St., has arranged for the erection of a new building on Eddy St., estimated to cost about $25,000.

Indiana

GREENCASTLE—The Greencastle Gas & Electric Co. is planning for the installation of a water-gas set and other equipment at its artificial gas plant.

Louisiana

NEW ORLEANS—The United States Rubber Co., is reported to be planning for the rebuilding of the portion of its local plant, recently destroyed by fire. The amount of fire loss has not been officially announced.

Maine

BOWDOINHAM—The Sagadahoc Fertilizer Co., lately purchased by new interests, will hold in temporary abeyance the erection of a proposed addition to its local mill. E. E. Philbrick, Demariscotta, Me., is one of the heads of the company, in charge.

Massachusetts

SALEM—The Yarnell Tanning Co., Inc., Tremont Place, is completing plans for the construction of a new 3-story and basement tannery, 35x55 ft., and purposes to break ground at an early date. Wesley L. Minor, 50 Pemberton Sq., Boston, is architect.

Michigan

KALAMAZOO—The MacRay Concrete Products Co., 1425 Ravine Rd., recently organized, has commenced the construction of a new plant, 46x87 ft., to be equipped for the manufacture of cement and concrete tile, and kindred products. It is estimated to cost about $20,000. William MacKinzie and Edward G. Raymond head the company.

DETROIT—The Capitol Brass Works, Inc., 2306 Franklin St., will commence the construction of a 4-story addition, to cost about $37,000, for which a general contract has been awarded to Harry M. Frier, 1302 Penobscot Bldg.

ESSEXVILLE—The Aetna Portland Cement Co. has plans under way for extensions and improvements in its plant, to include the installation of two new kilns and additional equipment, designed to increase the capacity of the plant from 1,200 to 2,000 bbl. daily. The work will be carried out early in the spring, and is estimated to cost about $250,000, including equipment.

BIG RAPIDS—The Ornamental Bronze Co., recently organized, has leased a portion of the local plant of the Binney Machine Co., for the establishment of a works for the manufacture of bronze and aluminum specialties. E. R. Deady is one of the heads of the company.

Missouri

WAPPAPELLO—The Taskee Iron & Ore Co., engaged in development work in this section for several months past, has plans under way for the construction of a new concentrating mill and ore-washing plant in the vicinity of Taskee, near Wappapello. All machinery will be electrically operated. The plant is estimated to cost about $100,000, including equipment. The company has a tract of about 11,000 acres of land in this section. H. E. Springer and I. W. Rodgers are heads.

CAPE GIRARDEAU—The Marquette Cement Co. will make extensions and improvements in its plant to cost about $100,000, including equipment. A new 3-story packing and loading works, 80x100 ft., will be constructed. The MacDonald Engineering Co., 53 West Jackson Blvd., Chicago, Ill., is engineer.

New Jersey

PAULSBORO—The Vacuum Oil Co., 61 Broadway, New York, is perfecting plans for the erection of a new refining plant on local site with initial output of about 5,000 bbl. per day. It will operate under the silica gel process, and will be the first refinery in this section to utilize this method of production.

JERSEY CITY—Fire, Dec. 6, damaged a portion of the plant of the Manufacturers' Oxygen Co., 55 Westside Ave., manufacturer of industrial oxygen, with loss reported at $10,000. It is planned to rebuild.

KEASBEY—The National Fireproofing Co., Fulton Bldg., Pittsburgh, Pa., has commenced clearing the site at its local hollow tile-manufacturing plant, recently destroyed by fire, and is said to have plans for the early rebuilding of the works, to cost in excess of $300,000. Additional equipment will be installed.

NEWARK—The Port Newark Brick Co., recently organized, headed by William Decker, 118 Clinton Ave., will commence the construction of its proposed local plant on tract of 2½ acres of land leased from the city at Port Newark, for the manufacture of sand-cement brick. A portion of the works will be given over to the production of cement color brick. The initial plant will cost approximately $250,000, including machinery.

New York

BROOKLYN—The Organic Preparation Co., 60 Hewes St., is completing plans and will soon take bids for a 1-story addition, 60x140 ft., estimated to cost close to $50,000, with equipment. Tillion, Acock & Tillion, 103 Park Ave., New York, are architects.

NEW YORK—The Cuba Cane Sugar Corp., 112 Wall St., is perfecting plans for the construction of a new refinery at Velasco, Cuba, and expects to commence work at an early date. Machinery now located at mills at Lequeitio, Centrals Felis and Socorro, Cuba, will be used at the new plant, and additional equipment installed.

North Carolina

HIGH POINT—The Marietta Paint & Color Co. has preliminary plans in progress for the erection of an addition to its plant for considerable increase in output.

Ohio

TOLEDO—The Hickox Production Co., Richards Rd., near Bancroft St., manufacturer of oil products, has purchased a tract of 3 acres of land adjoining its plant and plans for the construction of a new refinery to cost close to $500,000, including machinery. It is expected to perfect details at an early date.

DAYTON—The Elam Paper Co., Marion, Ind., is completing plans and will commence the construction of its proposed local plant at an early date, estimated to cost close to $35,000. The present mill at Marion will be removed to this location.

TOLEDO—The Standard Oil Co. is reported to have plans for the construction of an addition to its refining plant in the East Side district, to cost in excess of $1,000,000, with machinery.

Oregon

PORTLAND—The Portland Pulp & Paper Co., recently organized with a capital of $1,500,000, has acquired property in the Peninsula section, North Portland, as a site for a new pulp and paper mill, with main building, 80x300 ft., and a number of smaller units, including power house, estimated to cost $750,000. It is expected to have plans drawn at an early date. Roy H. Mills, 815 Broadway Bldg., heads the company.

PRINEVILLE—The Central Oregon Sugar Co., lately formed under state laws with a capital of $1,500,000, has engaged the Schwartz Engineering Co., Denver, Colo., to prepare plans for its proposed refining plant on local site, estimated to cost about $850,000. It is purposed to break ground early in the spring. The plant will include a power house, machine shop and other auxiliary structures. A. G. Goodwin is president and treasurer, and I. C. Emmett assistant secretary and treasurer, both of Portland, Ore.

OREGON CITY—The Hawley Pulp & Paper Co., 3rd and Main Sts., has preliminary plans for the construction of a new pulp and paper mill to cost approximately $1,000,000, including equipment. A power plant will also be erected. It is proposed to break ground during the coming year.

Pennsylvania

COPLAY — The Coplay Cement Mfg. Co. will make extensions and improvements in its Mill C, to include the installation of additional kiln equipment to replace present apparatus, and other operating machinery.

LANCASTER—The Lancaster Vinegar Co., has preliminary plans under advisement for the rebuilding of the portion of its local plant, destroyed by fire, Dec. 2, with loss estimated at $75,000, including equipment. The plant is operated by the E. A. Ransings Sons Co.

PALMERTON—The New Jersey Zinc Co. has plans for the erection of a new building at its plant, and will break ground at an early date.

PITTSBURGH—The Prest-O-Lite Co., Tabor St., manufacturer of acetylene gas products, has filed plans for the erection of a works addition at Lincoln Ave. and Tabor St., to cost about $27,000.

Tennessee

MEMPHIS—The Valley Cotton Oil Co., has preliminary plans for the rebuilding of the portion of its plant destroyed by fire, Dec. 2, with loss estimated at $150,000, including equipment and stock.

ROCKWOOD—The Cardiff Brick & Tile Co. has plans under way for extensions and improvements in its plant, including the construction of new kilns, mechanical drying equipment, etc., to cost about $20,000. S. N. Oakley is secretary.

Texas

DALLAS—Fire, Nov. 28, at the plant of the Trinity Portland Cement Co., Eagle Ford Rd., caused a loss of about $25,000. Plans are under way for rebuilding.

SAN ANTONIO—The Southern Cement Products Co., Menchaca St., has purchased property adjoining its plant and plans for the construction of a new addition.

Virginia

BEDFORD—The Bedford Tire & Rubber Co., recently formed with a capital of $1,000,000, is perfecting plans for the construction of a new local plant, consisting of a main unit, 80x300 ft., with adjoining smaller structures. Equipment will be provided for the employment of about 300 operatives. At a later date, it is purposed to expand the plant to double this working force. It is estimated to cost about $125,000. L. R. Gills is president, and J. J. Scott, secretary and treasurer.

Washington

SEATTLE—The Charles H. Dilly Co., West Waterway, at Hanford St., manufacturer of fertilizer products, plans for the rebuilding of the portion of its plant destroyed by fire, Dec. 1, with loss estimated at $23,000.

Wisconsin

TOMAHAWK—The Tomahawk Kraft Paper Co. has commenced the construction of a new digester building at its plant, estimated to cost about $85,000, and purposes to have the unit ready for service at an early date.

MILWAUKEE—Plans are being considered by the Prime Mfg. Co., 653 Clinton St., for the construction of a new brass and bronze foundry at its plant, to cost about $60,000, with equipment. O. L. Prime is president.

Wyoming

CASPER—The Standard Oil Co. of Indiana, Indianapolis, Ind., plans for the installation of additional stills and other equipment at its local refinery, to be used for the production of asphalt.

New Companies

SEABOARD INDUSTRIAL ALCOHOL CO., INC., 8 Bergenline Ave., Union Hill, N. J.; industrial alcohol and kindred products; $100,000. Max Levitan is the principal incorporator.

REVERE SUGAR REFINERY, INC., Boston, Mass.; to operate a sugar-refining plant; $375,000. Andrew W. Preston is president, and Cecil B. Taylor, 162 Babcock St., Brookline, Mass., treasurer.

UNITED CLAY PRODUCTS CO., Martinsburg, W. Va.; tile and other burned clay products; $50,000. Incorporators: W. Crosdale Witts, Martinsburg; and Clyde L. Miller, 1613 Newton St., N. E., Washington D. C.

CLIFTON CHEMICAL CO., New York; chemicals, soaps and kindred products, $50,000. Incorporators: D. J. Bachrach, E. M. Marnes and L. B. Schwarfaes. Representatives: Guggenheimer, Strasser & Meyer, 27 William St., New York.

MERKLE MFG. CO., 611 South Fremont St., Baltimore, Md.; fiber products; $10,000. Incorporators: Joseph L. and Edgar A. Merkle.

EDWARDS TURPENTINE CO., Savannah, Ga.; turpentine and kindred products; $10,000. Incorporators: J. C. and Charles G. Edwards, both of Savannah.

C. J. MATTHEWS CO., INC., Philadelphia, Pa.; leather products; nominal capital $5,000. Joseph P. Murray, 911 South 50th St., Philadelphia, is treasurer.

PARIS REFINING CO., Paris, Tex.; refined petroleum products; $75,000. Incorporators: H. D. Brown, Lon Gilmore and Harold Hendrick, all of Paris.

WHITFIELD PAPER WORKS, INC., Red Bank, N. J.; paper products; $200,000. Incorporators Howard Whitfield and Warren H. Smock, Red Bank.

MOBILE CHEMICAL CO., INC., Mobile, Ala.; chemicals and chemical byproducts; $50,000. Incorporated under Delaware laws. Representative: Colonial Charter Co., Wilmington, Del.

CAST STONE BRICK & TILE CO., Portland, Ore.; cement tile, etc.; $15,000. Incorporators: John F. Casey, L. E. Bufton and Fred J. Meindl, Railway Exchange Bldg., Portland.

INDIANAPOLIS STEEL CORP., Indianapolis, Ind.; steel products; $250,000. Incorporators: Walter Bledsoe, Edward E. Silk and W. N. Cox, all of Indianapolis.

PANTHER CREEK OIL CO., Owensboro, Ky.; petroleum products; $24,000. Incorporators: Julius C. Miller and W. W. Damron, both of Owensboro.

DESTI, INC., New York; chemicals and chemical byproducts; $50,000. Incorporators: F. I. and J. H. Finkler, and R. Greenbaum. Representative: Finkler & McIntyre, 2 Restor St., New York.

LONG BEACH PLATE & SHEET GLASS CO., Augusta, Me.; glass products; $75,000. E. M. Leavitt is president, and E. F. Porter, treasurer. Frank E. Southard, Augusta, is clerk and representative.

ALPHA DISTILLING CO., Room 722, 38 South Dearborn St., Chicago, Ill.; industrial alcohol and kindred products; $50,000. Incorporators: J. S. Knight and G. J. Nikolas.

PHILADELPHIA RUBBER WORKS CO., Philadelphia, Pa.; rubber products; incorporated under Delaware laws, $3,800,000. Representative: Corporation Trust Co. of America, du Pont Bldg., Wilmington, Del.

ATLAS ALUMINATE CEMENT CO., Calvert Bldg., Baltimore, Md.; 1,500 shares of stock, no par value; cement products. Incorporators: George S. Newcomer, D. L. Warner and Douglas H. Rose.

OWENS OIL & REFINING CORP., OF NEW YORK, INC., Jamestown, N. Y.; refined oil products; $250,000. Incorporators: W. A. Paulson and J. Carlson. Representative: A. C. Nelson, attorney, Jamestown.

CUMBERLAND CLAY PRODUCTS CO., Rosenhayn, N. J.; tile and other burned clay products; 500 shares of stock, no par value. Incorporators: James K. Coyne, George Wanger and Norman W. Harker, Rosenhayn.

ALLIANCE OIL CO., Boston, Mass.; oil products; $875,000. Howard A. Cutler, 9 Abbott St., Andover, Mass., is president and treasurer.

Opportunities in the Foreign Trade

Parties interested in any of the following opportunities may obtain all available information from the Bureau of Foreign and Domestic Commerce at Washington or from any district office of the bureau. The number placed after the opportunity must be given for the purpose of identification.

ALCOHOL, INDUSTRIAL. Basel, Switzerland. Agency.—8413.

BLEACHING POWDER, carbolic acid crystals, acetic acid, and sugar of milk. Shanghai, China. Purchase.—8407.

CAUSTIC SODA, soda ash, and sodium bisulphite. Harbin, China. Purchase.—8470.

CHEMICALS. Landskrona, Sweden. Agency.—8432.

CHEMICALS, HEAVY. Dublin, Ireland. Agency.—8425.

CHEMICALS HEAVY, such as bichromate of potash, and soda, caustic soda, and benzol. London, England. Purchase.—8427.

CHEMICALS for agriculture and wine culture. Colombier, Switzerland. Agency.—8438.

CHEMICALS for use in tanning. La Paz, Bolivia. Purchase.—8436.

CHEMICALS and raw materials for paints. Antwerp, Belgium. Agency.—8415.

FERTILIZERS AND CHEMICALS. Buenos Aires, Argentina. Agency.—8396.

MANGANESE CHLORIDE, 10 to 20 tons per month. Durban, South Africa. Purchase.—8479.

PAINTS. Hamilton, New Zealand. Agency.—8406.

PAINTS. Tsingtau, China. Purchase.—8452.

PAINTS AND VARNISHES. Havana, Cuba. Agency.—8418.

PAINTS, varnishes, and paint brushes. Dublin, Ireland. Agency.—8425.

PAINTS, varnishes, linseed oil and turpentine. Cork, Ireland. Agency.—8426.

ROSIN of all grades, and turpentine. Stockholm, Sweden. Purchase and agency.—8467.

ROSIN AND CAUSTIC SODA. Sao Paulo, Brazil. Agency.—8477.

CAUSTIC SODA, solid, 75/76 per cent. Chemnitz, Germany. Purchase.—8459.

SULPHUR, rock or crude. Johannesburg, South Africa. Agency.—8462.